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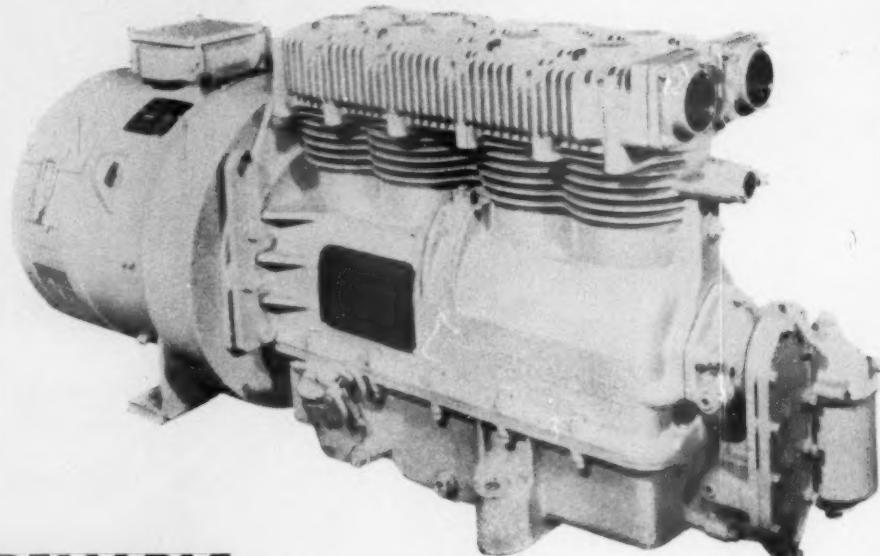
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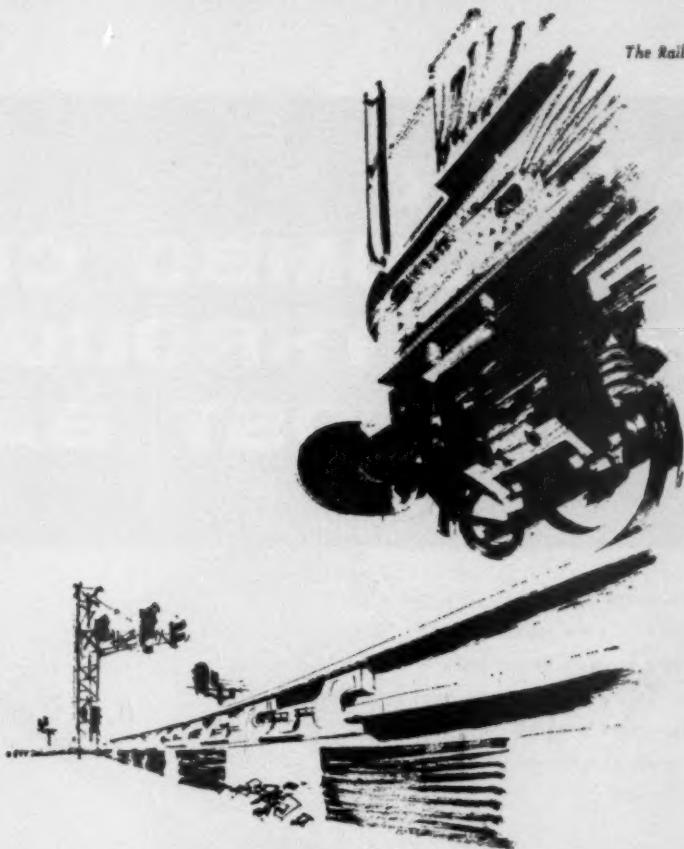
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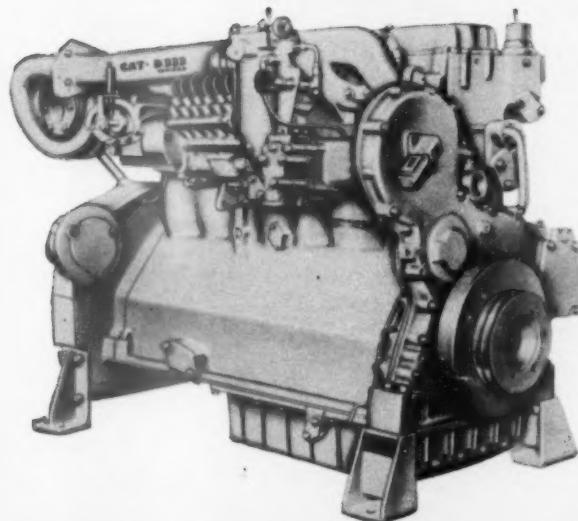
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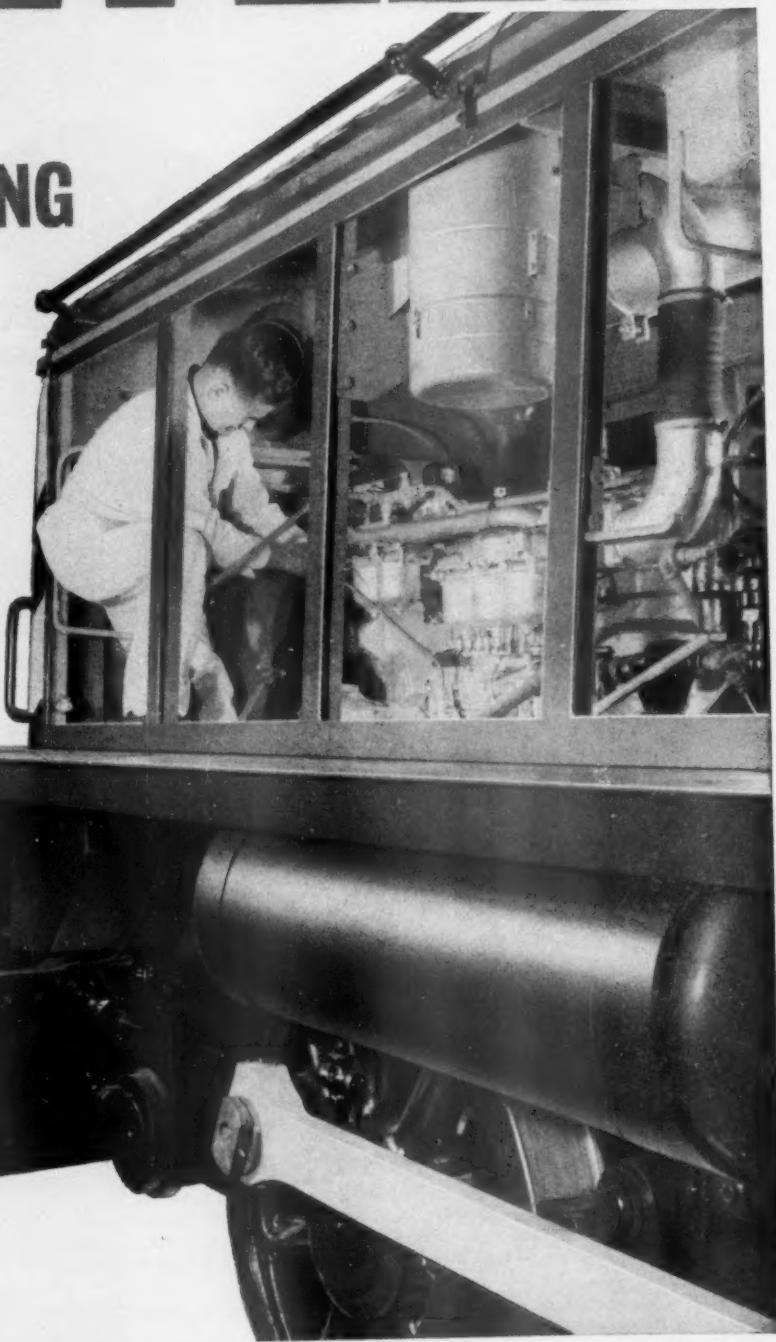


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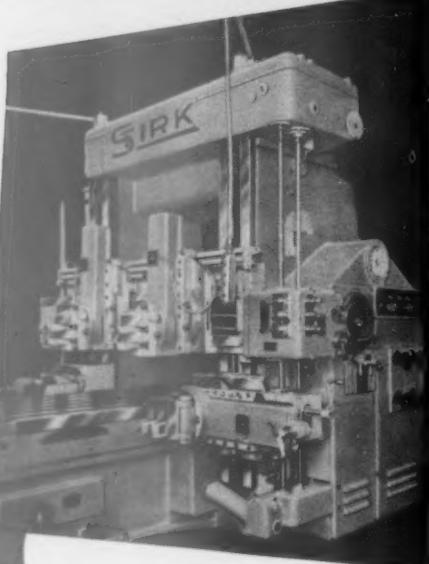
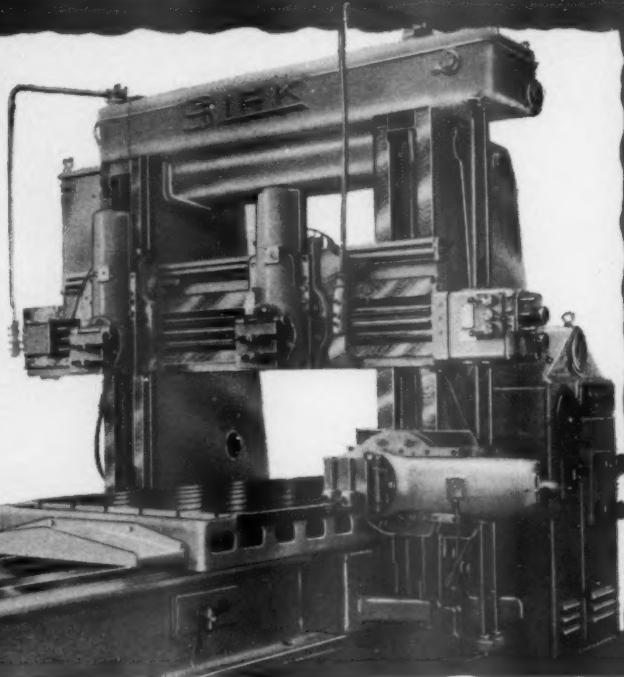
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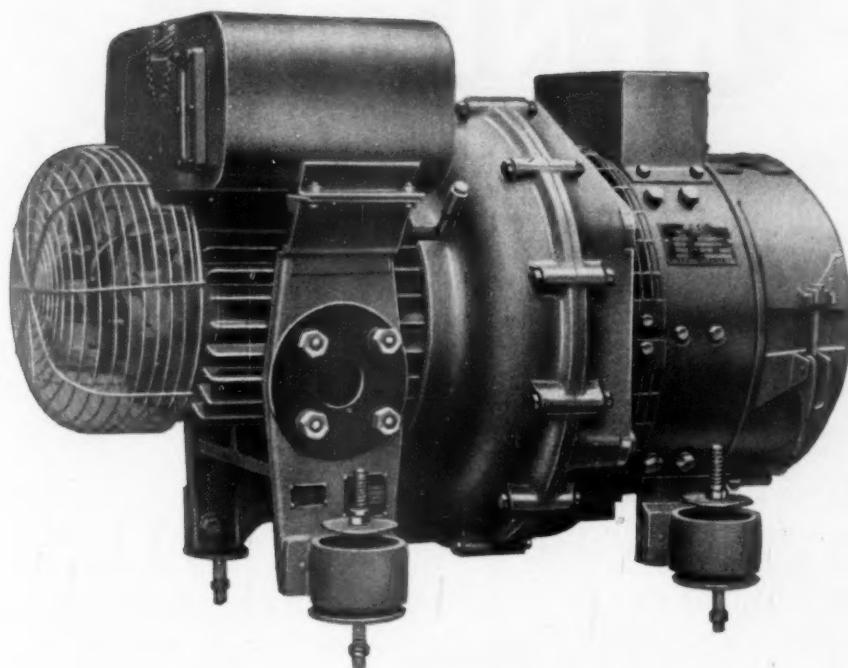


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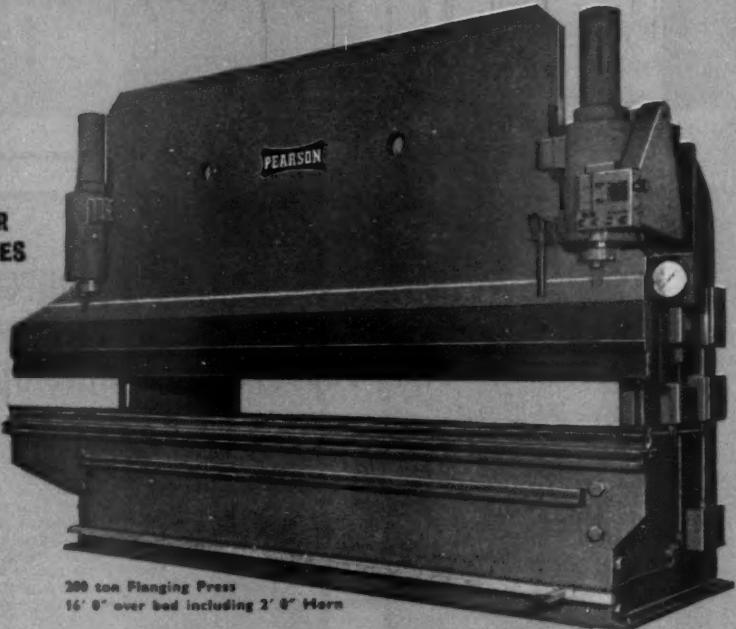
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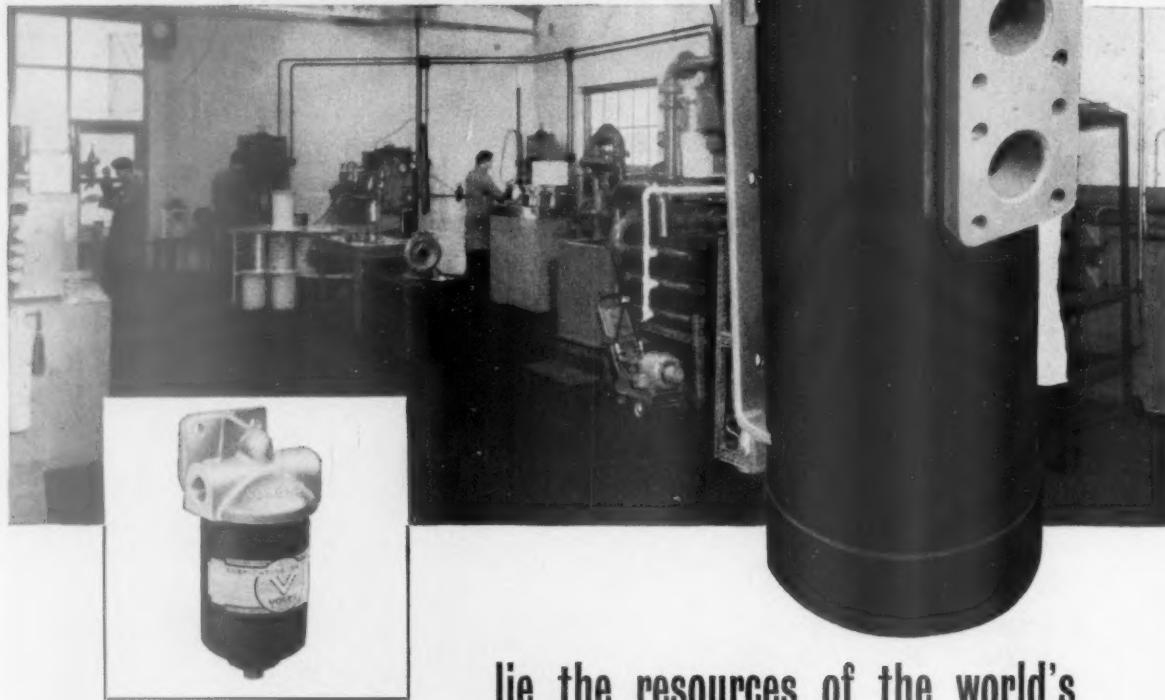
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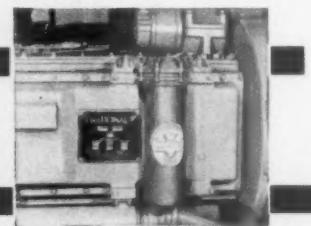
largest filtration research and development laboratories

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Left is a lube oil filter, incorporating the unique Vokes by-pass device, designed to filter oil carried in external piping. Its outstanding, easily renewed VAF 66 filter cartridge has, compared with other similar size elements, greater sludge holding capacity, considerably improved flow characteristics and longer life. Above is a 'Top Servicing' lube oil filter, with VAF 2 filter element, featuring a single articulated clamp ring which considerably simplifies element renewal. Vokes lubricating oil filters are inexpensive on first cost, simple to install and the most economical in use.



We are indebted to the companies concerned for permission to reproduce these photographs.

Vokes 'Top Servicing' filter fitted in the engine compartment of a type 2 loco built for British Railways by British Traction Ltd.

Two Vokes 'Top Servicing' filters serve the 24 bays of the Test Shop of Tilling-Stevens Ltd., a member of the Rootes Group.

Vokes lubricating oil filter fitted to a diesel engine manufactured by the National Gas & Oil Engine Co. Ltd.

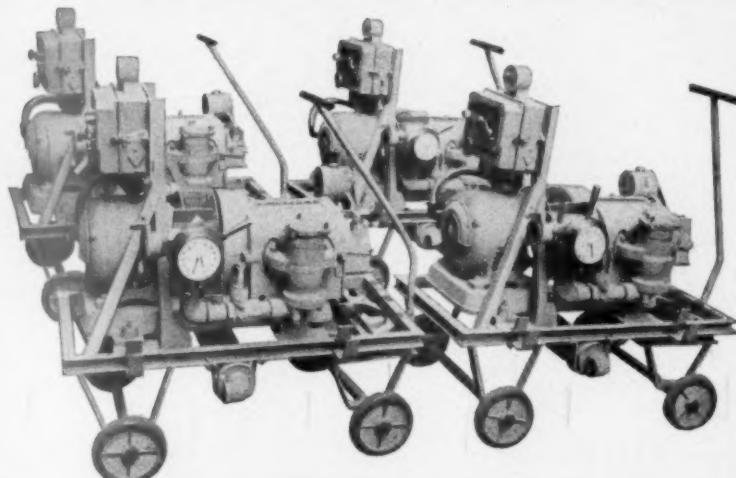
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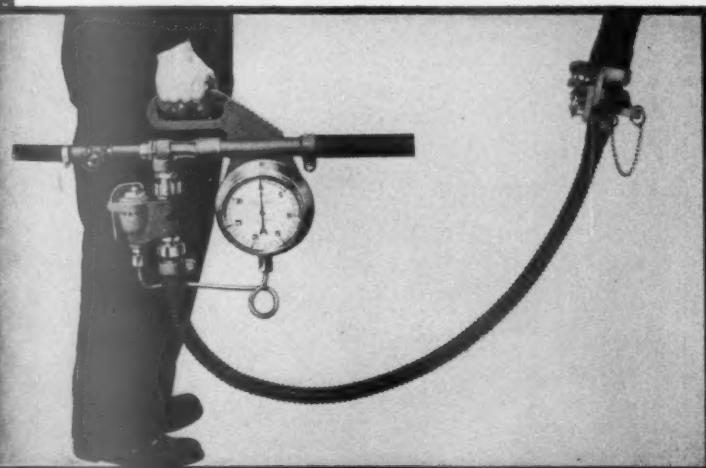
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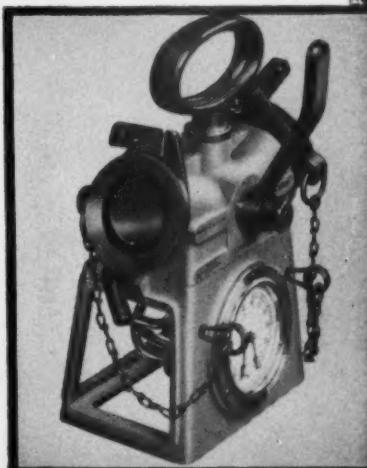


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Illustration shows part of a consignment of motor driven portable testing sets incorporating Northey rotary exhausters of 90 c.f.m. capacity.



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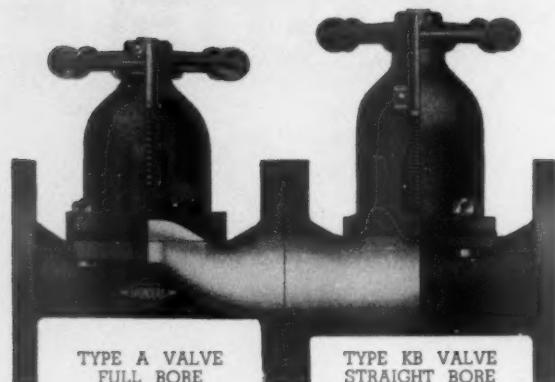
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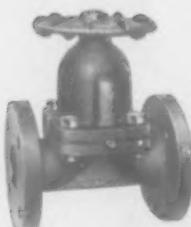
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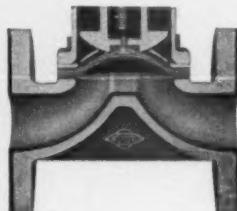
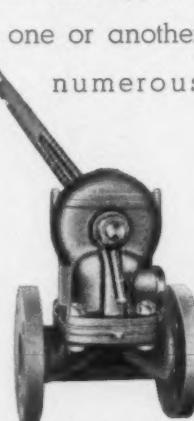
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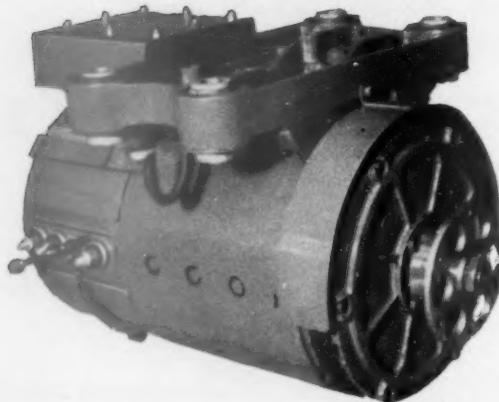
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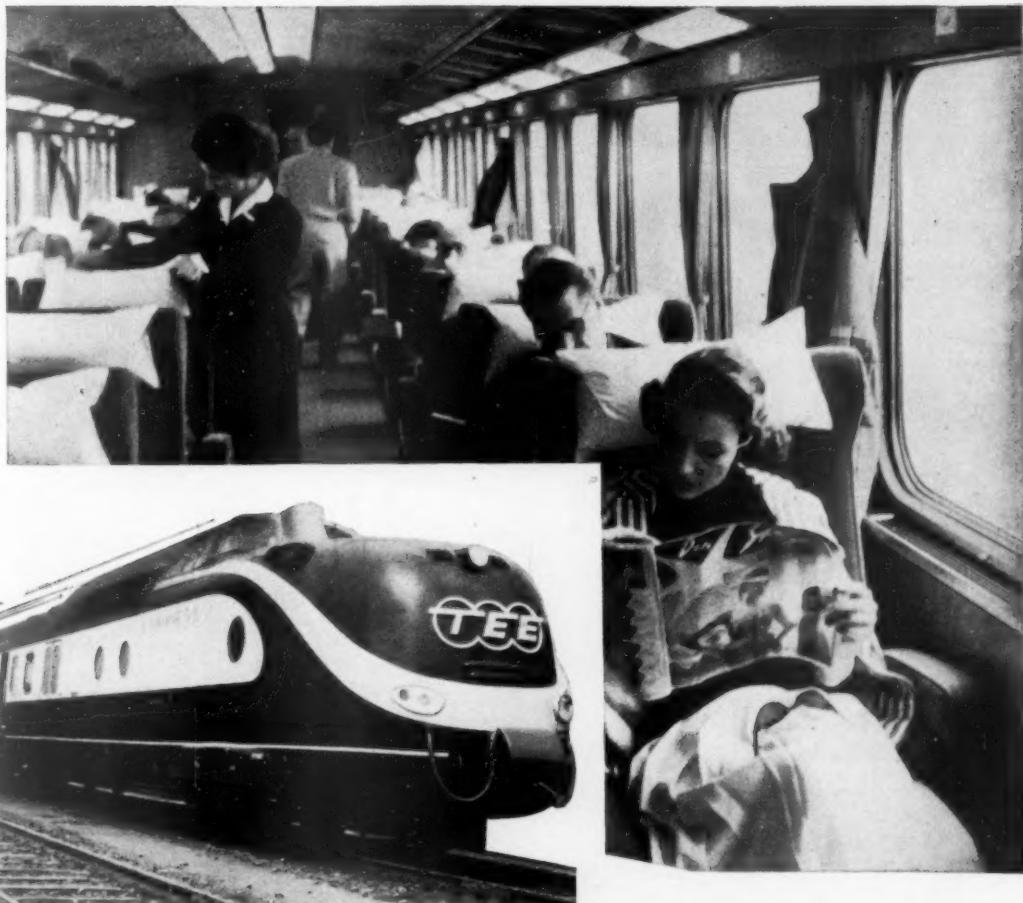
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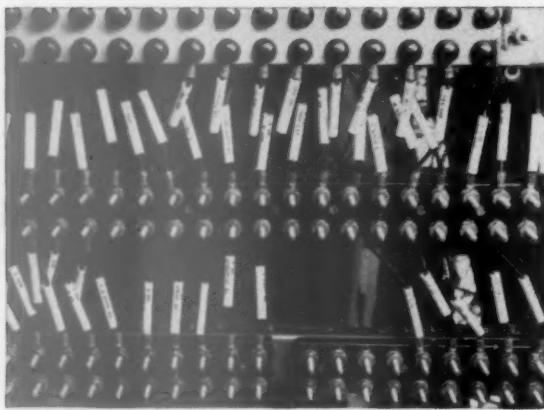
200-202, Hanauer Landstrasse. Telephone: 48541. Cable Address: Luwa Frankfurtmain. Telex: 0411775

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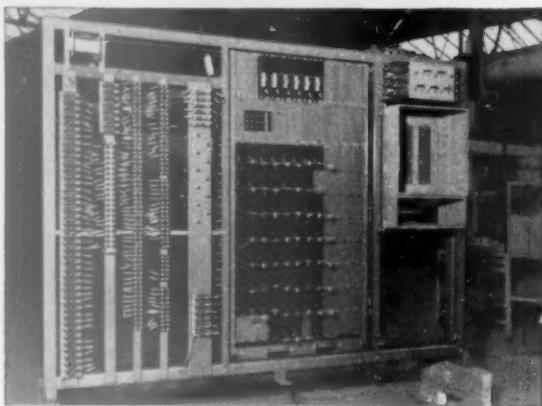
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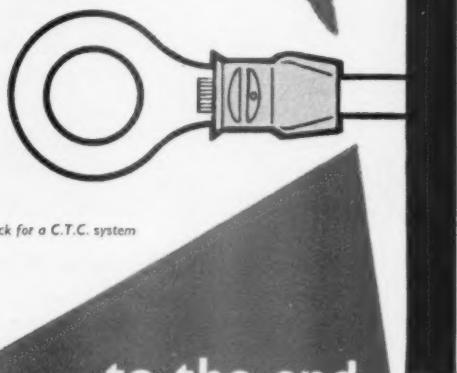
Close up showing *Plastibond Terminals.



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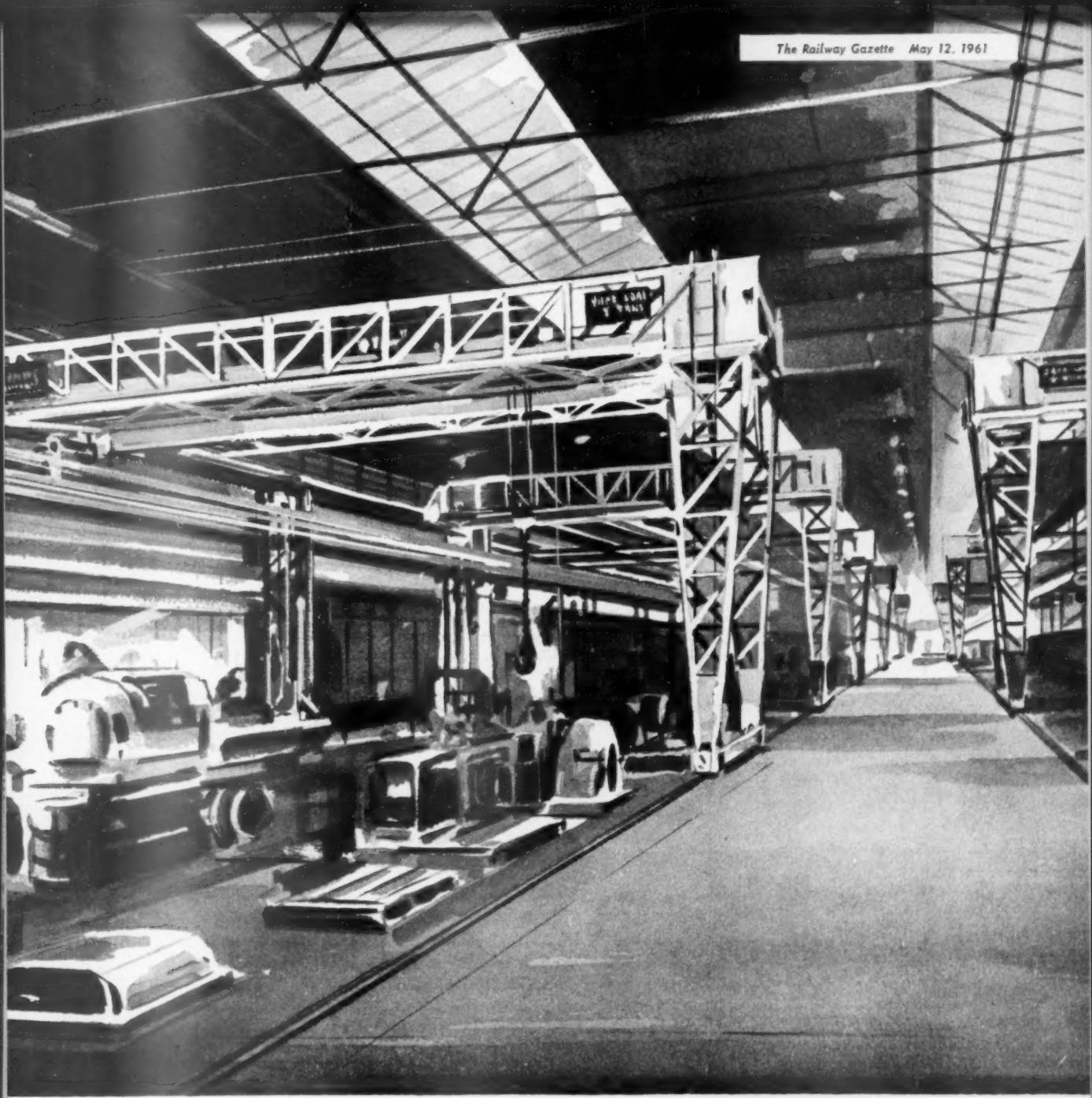
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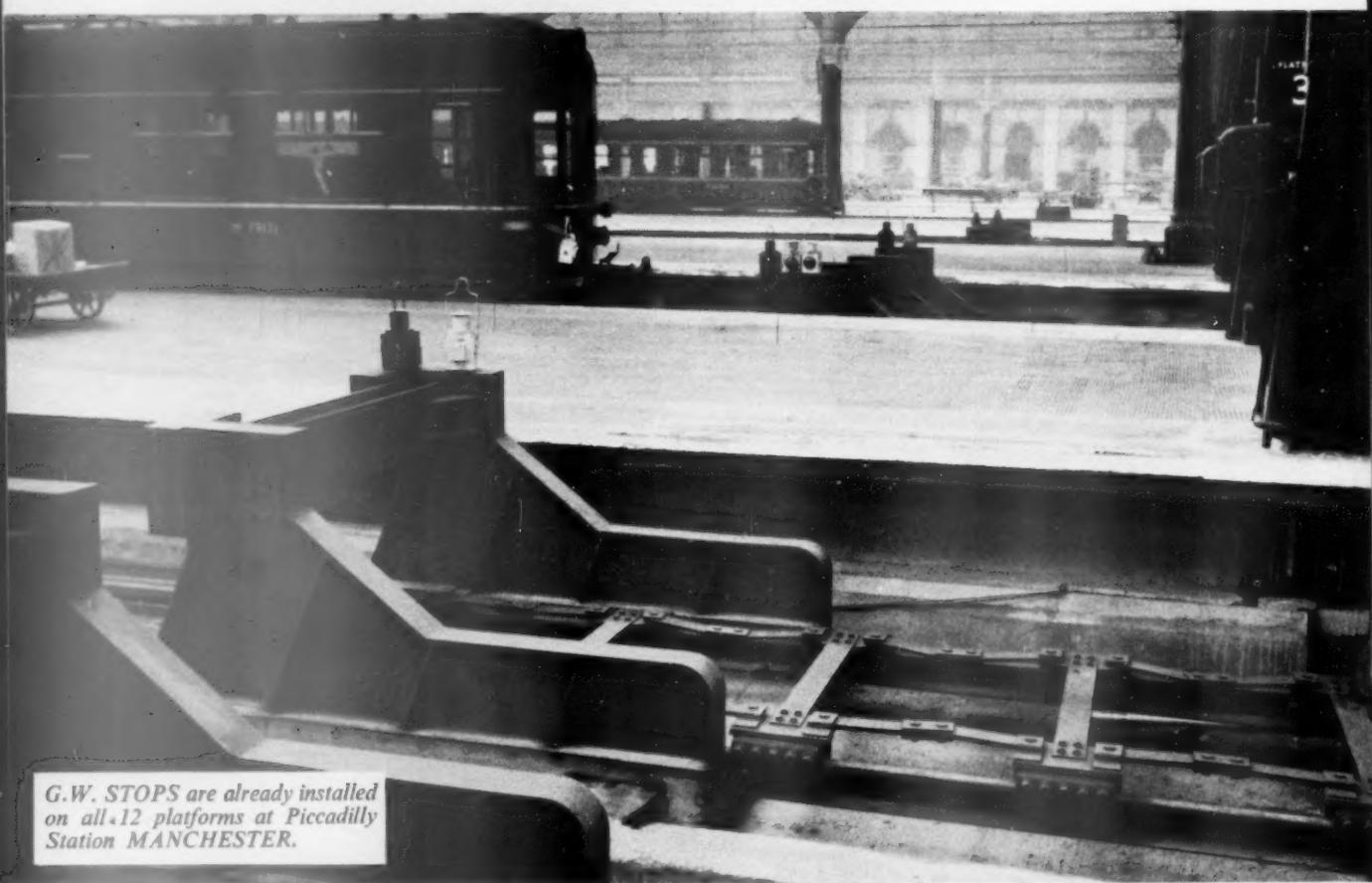
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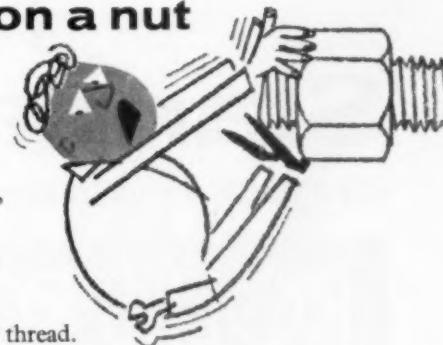
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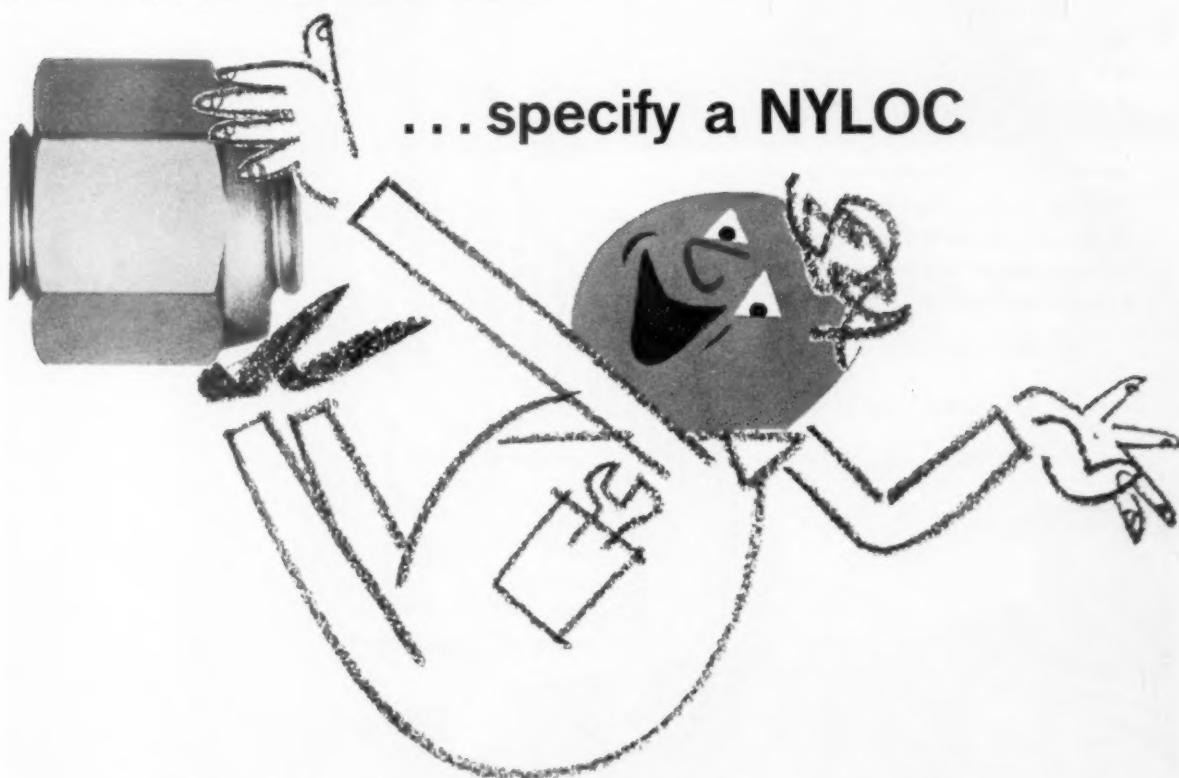
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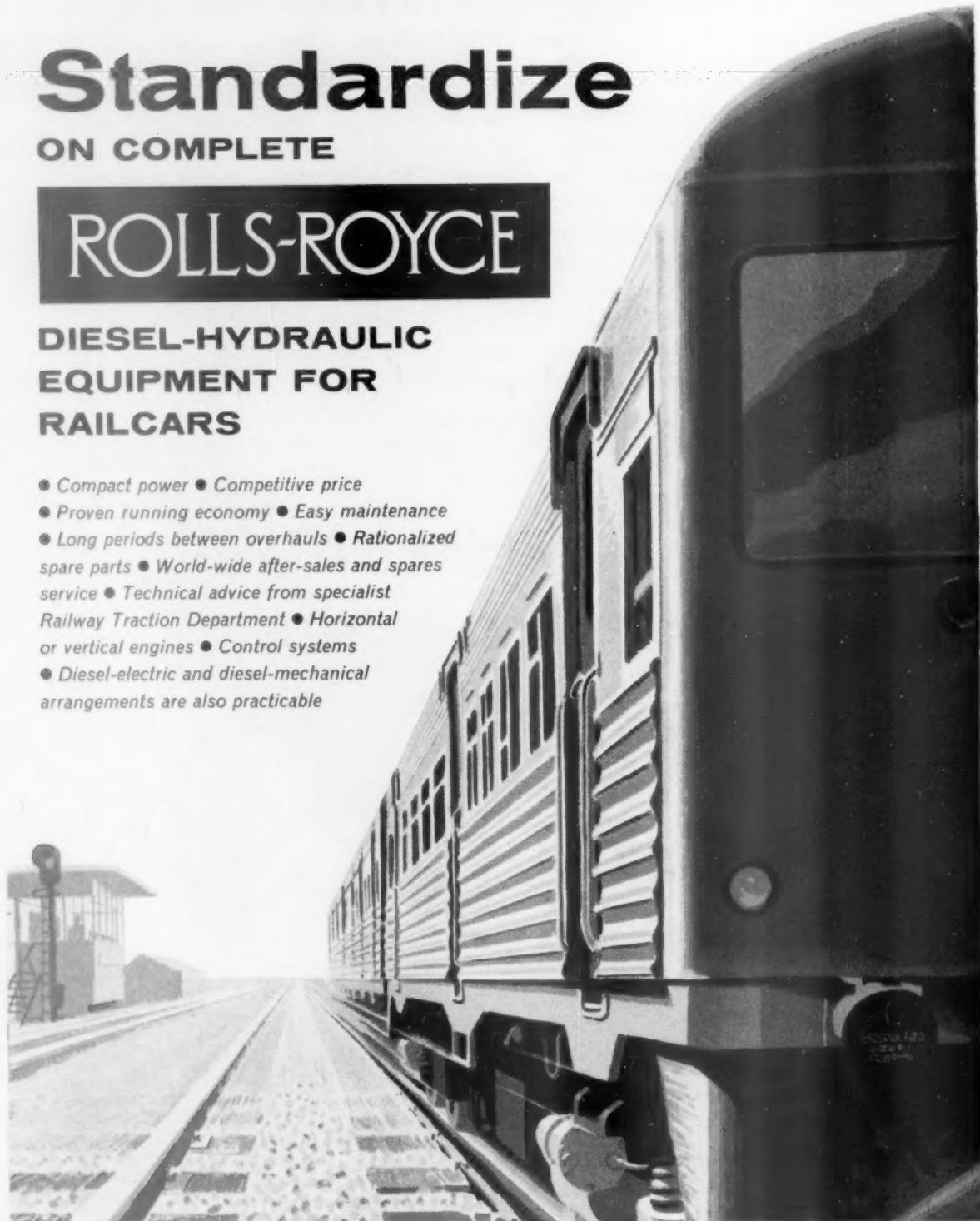
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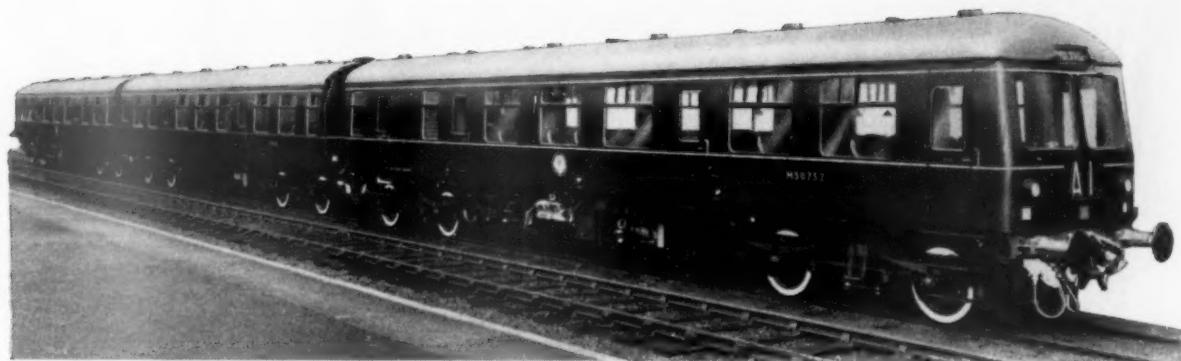
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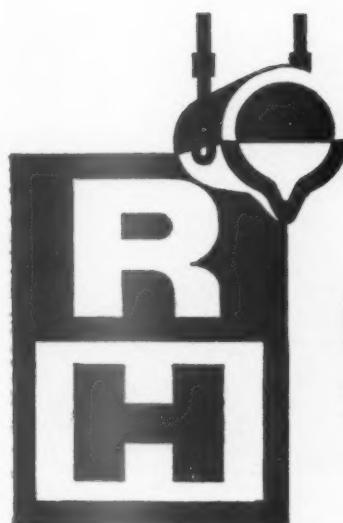
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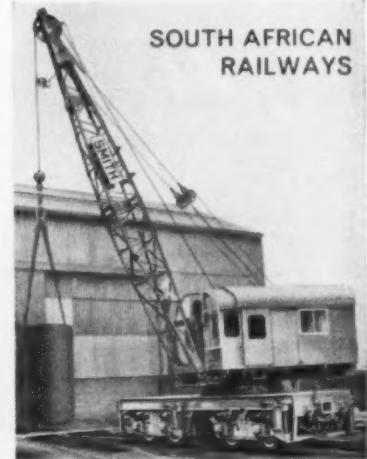
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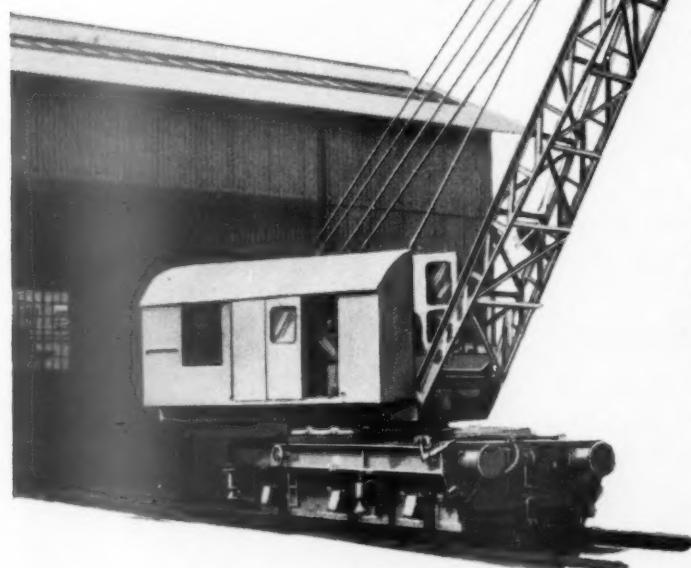
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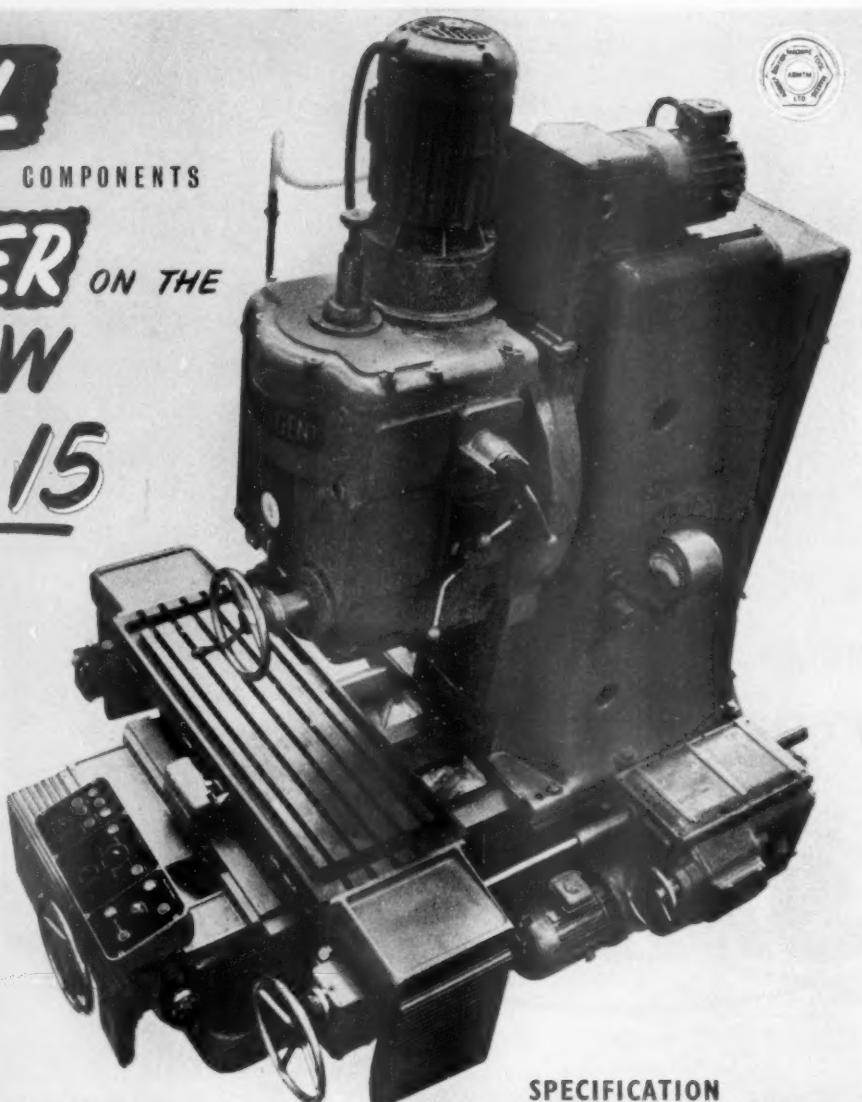


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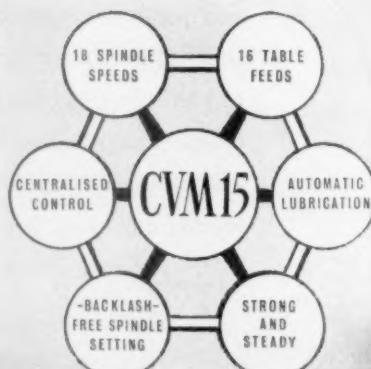
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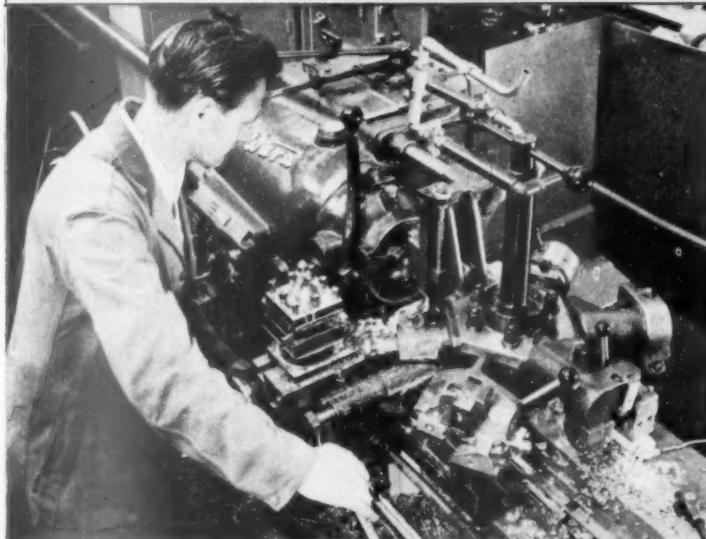
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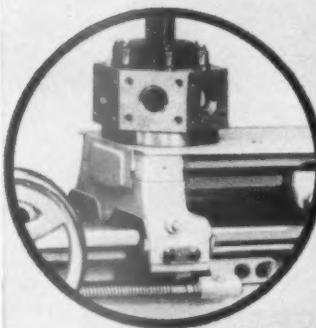
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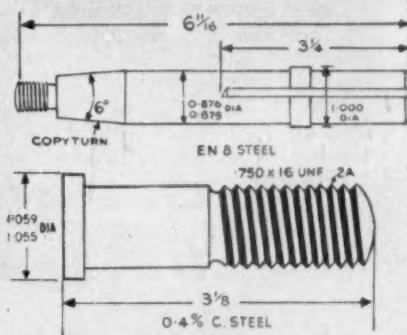
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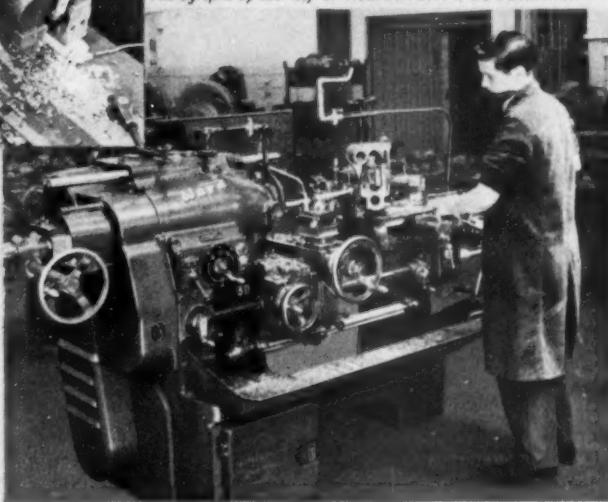
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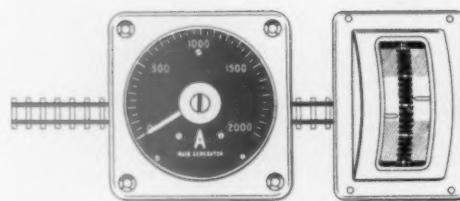
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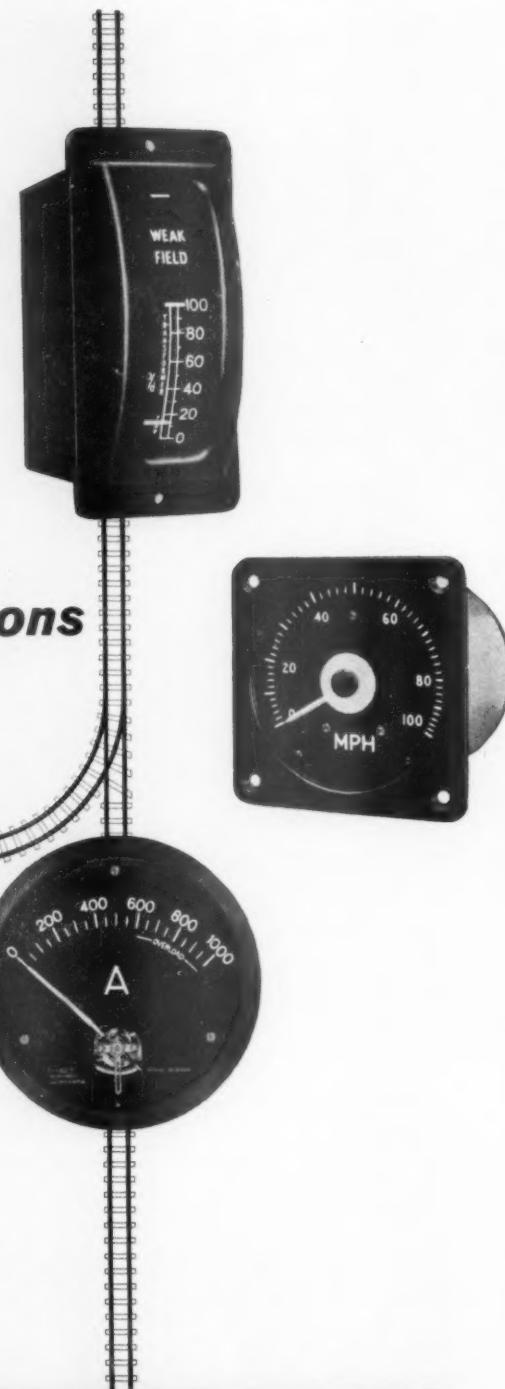
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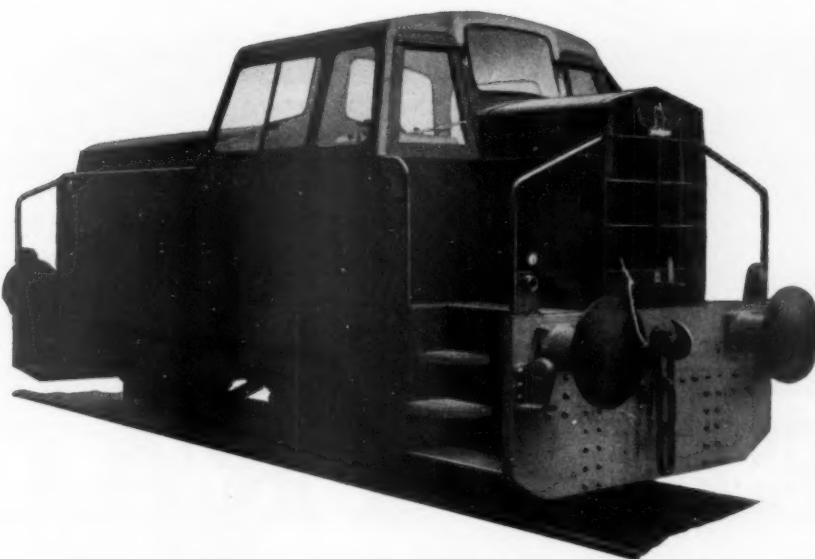
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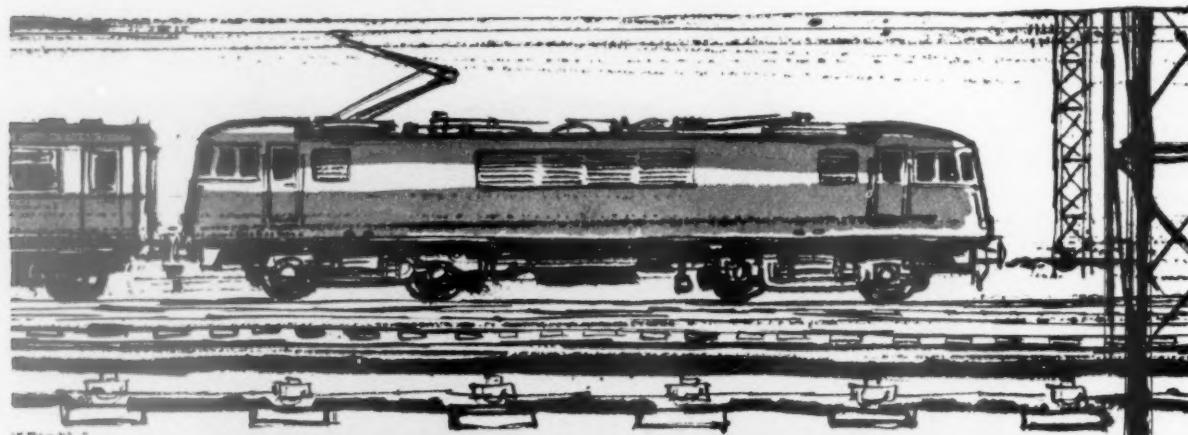
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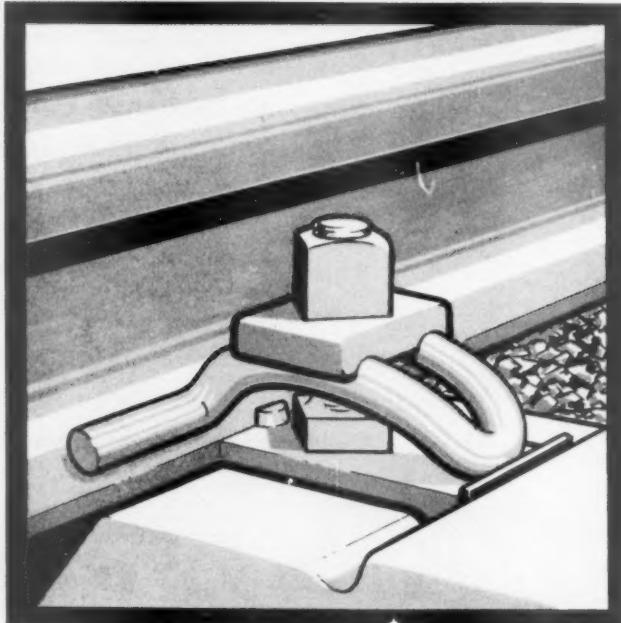
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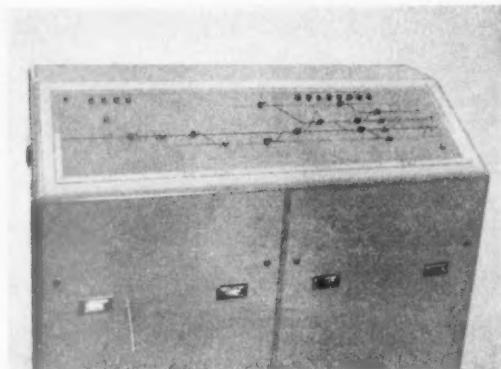


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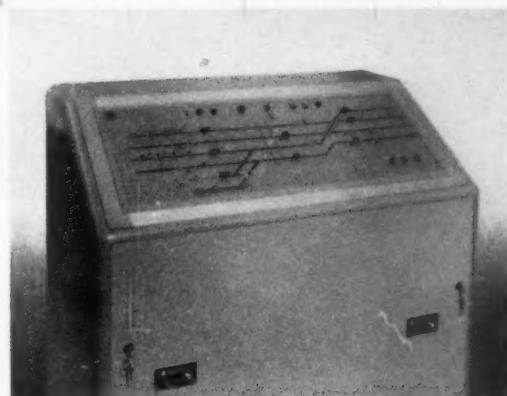
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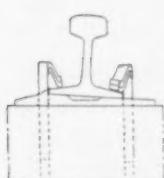
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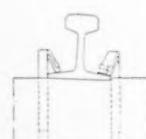
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A journal of Management, Engineering and Operation

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To divide is to multiply

AS FROM the end of this month, Dr. Richard Beeching will assume the chairmanship of the British Transport Commission. By then he will have served as a part-time member for rather more than two months, and, in addition, will have had his experience as a member of the Stedeford Committee to call on in his assessment of the problems he has to face in the setting up of the British Railways Board, and the implementation of the very vague terms of the White Paper on the reorganisation of the nationalised transport undertakings. The new Chairman, in implementing the terms of the White Paper, at least will have a good deal of freedom of action, for that document is so vague that it will be difficult for its sponsors to criticise any action he takes which is even remotely within the so-called remit which the Government has laid down. If in the future Dr. Beeching is to be concerned solely with the office of Chairman of the British Railways Board, he may be wondering why it is necessary to divorce from the railways so many of the more remunerative ancillary businesses and place them

under a new holding company responsible directly to the Minister. Assuming that this part of the plan is proceeded with, a great deal of the future prosperity of the nationalised transport undertakings as a whole will depend on how this severance is effected, and how far it goes. If the operation is conducted in the manner which would appear to be laid down in the White Paper, it will be found that to divide these businesses is to multiply not only their staffs but their costs, and, probably, to diminish their profitability. If the division is carried out in a way which will enable the subsidiary companies of the holding company to make use of common services, as has been the practice during the lifetime of the Commission, a good deal of waste and additional cost, both in money and manpower, may be avoided. Probably Dr. Beeching, with his experience of organisation at Imperial Chemical Industries, will have some strong views on matters of this kind.

£5-million contract placed by B.T.C.

AN ORDER of the approximate value of £5 million has been placed by the British Transport Commission with the Clayton Equipment Co. Ltd. for 88 Type 1 diesel-electric locomotives. These will have a BB wheel arrangement and be equipped with two 450-h.p. Davey Paxman six-cylinder horizontal diesel engines, each driving a separate generator. Electrical equipment will be supplied by the General Electric Co. Ltd. Outstanding features will be all-round accessibility to machinery and maximum vision from the cab, which will be centrally-placed and full-width, raised above and set between low bonnets of equal length. Separate driving positions are to be provided for each direction of travel. Steam for train-heating will be generated by oil-fired boilers in the case of 20 of the locomotives. All the locomotives are for the Scottish Region of British Railways. Deliveries will begin in mid-1962.

C.I.M.A.C. recommendations

THE CONGRÈS International des Machines à Combustion has published its recommendations for diesel engine acceptance tests. These cover various applications, including the important one of rail traction. In connection therewith attention is drawn to the existence of rules of the International Railway Union (U.I.C.). These rules are of a compulsory nature for members of the U.I.C. and the present recommendations, it is suggested, may be used only in so far as they are not in discordance with the U.I.C. rules. The aim of the present recommendations is to establish unified regulation for the preparation, execution, and interpretation of acceptance tests. These tests have the general aim of certifying conformity with the contract specification and verifying the guarantees given by the supplier. Contractual conditions, arrangements for acceptance tests, test requirements, procedure for tests, correction of power and fuel consumption for differences in atmospheric conditions, and the preparation of a test report are covered. Copies of the recommendations, elaborated by the Technical Committee and approved by the Permanent Committee, are available from the Honorary Treasurer, British National Committee, 6 Grafton Street, London, W.1, at 10s. a copy, post free.

World Bank loan for Japanese Railways

THE WORLD Bank has made a loan equivalent to \$80 million to the Japanese National Railways for the new Tokaido line to link Tokyo with Osaka, via Yokohama, Nagoya, and Kyoto. The railway, which will parallel an existing heavily-overloaded line, will be used only for express and passenger freight trains, which will travel at maximum speeds of 125 and 94 m.p.h. respectively. The new line will comprise a standard-gauge double-track electrified system with 80 tunnels and about 11 miles of bridges. Self-propelled railcar sets will be used on all services—freight trains will have a maximum payload of 750 tons. Total cost is estimated at \$548 million, and it is planned to begin service over the entire length by 1964. The loan will cover about one-seventh of the total cost—the remainder will be raised in Japan. Foreign contractors are being invited to submit tenders for major construction work, which has already begun, and for supply of rolling-stock.

Guidance on Indian Railway Development

IN AGREEMENT with the Government of India, the World Bank—which is supplying much of the finance underlying Indian railway development—has secured the consulting services of a group of Canadian railway experts. These, comprising a mission jointly led by Mr. Stanley F. Dingle, Vice-President of the Canadian National Railways, and Mr. Laurence B. Unwin, a former Vice-President (Finance) of that system, will also include Mr. James M. Bentham, Engineer of Track and Mr. Kenneth D. Carmichael, General Freight Agent, both of the Canadian Pacific Railway, and Mr. Philip L. Mathewson, Assistant Chief of Motive Power & Car Equipment; Mr. William P. Moffat, Chief of Research, and Mr. Howard C. Reid, Assistant Vice-President, Finance, all of Canadian National Railways. After arriving in New Delhi on March 12 this year, the mission toured the Indian Railways for some three weeks. It was accompanied by Mr. James F. Main, a member of the World Bank staff and, until recently, head of its Transportation Division, and by senior officers of the Indian Railways.

Five freedoms and the buses

SPEAKING in London on May 8, Mr. J. S. Wills, Managing Director and Deputy-Chairman of the British Electric Traction group, announced the formation of "Britain's Buses"—an organisation formed by the three main groups of bus companies in Britain together with London Transport. The object of the organisation is to make known and remove obstacles which impede the provision of a first class bus service for Britain. Five freedoms are called for: freedom to operate, to move, to service, from ancient restrictions, and from unfair competition. Supporting Mr. Wills were Mr. A. B. B. Valentine, Chairman of London Transport, Mr. M. Holmes, Chairman of the Tilling group, and Mr. James Amos, Chairman of the Scottish Omnibuses group.

Metropolitan-Cammell Carriage & Wagon Co. Ltd.

THE ANNUAL report of Cammell Laird & Co. Ltd., of which the Metropolitan-Cammell Carriage & Wagon Co. Ltd. is a subsidiary company, states that the output of railway vehicles by Metro-Cammell last year considerably exceeded the value of orders received, which has resulted in a fall in the volume of work in hand. This reflects the continued decline in orders placed with private contractors by British Railways and fewer export orders due to increasing world-wide competition. No improvement in the difficult trading conditions for railway vehicles can be foreseen during the current year, but the company has made progress in obtaining alternative work. Among orders received last year were cars for London Transport, diesel railcars for Jamaica, and wagons for Pakistan and for British Railways. Deliveries of passenger vehicles included the completion of contracts for sleeping cars, standard coaches

and diesel railcars for British Railways, some of the new diesel Pullman de luxe express trains and Pullman cars for other long-distance trains and coaches for Rhodesia.

The Vulcan Foundry

AT A recent meeting of Vulcan Foundry stockholders it was agreed to cancel the £100,000 five per cent preference stock of the company. Each of the preference stockholders will receive from the English Electric Co. Ltd., £1 in cash for every £1 of preference stock held. Vulcan will become a wholly-owned subsidiary of English Electric. So far, English Electric has owned only 90 per cent of the capital, the remainder having been in the hands of about 200 preference stockholders. The Chairman, Lord Nelson of Stafford, has explained that the business of Vulcan and of its subsidiary company, Robert Stephenson & Hawthorns Limited, had been progressively integrated with the traction business of English Electric during the past six years. This process was expected to continue, and to provide freedom of manoeuvre, the Directors felt it was desirable that Vulcan should now become a wholly-owned subsidiary of English Electric.

Malayan Minister to visit Britain

UNDER the auspices of the Ministry of Transport, the United Kingdom Railway Advisory service has made special preparations to ensure that during the current visit of the Honourable Enche Sardon bin Haji Jubir, Minister of Transport for Malaya, he is enabled to obtain a good cross-sectional view of British industry so far as it can be of service to Malaya. The Malayan Minister of Transport and his wife, who are being accompanied during his present visit by Mr. E. T. Williams, the General Manager of the Malayan State Railways, arrived at London Airport on Tuesday last, where they were welcomed by Lord Chesham, Parliamentary Secretary, at the British Ministry of Transport. During the same day the Minister's party was entertained to lunch by the Chamber of Shipping of the United Kingdom, and later met Mr. Ernest Marples, the Minister of Transport, and Mr. Duncan Sandys, the Secretary of State for Commonwealth Relations.

On Wednesday, after calling on the Crown Agents, the party visited the exhibition of locomotives which is being held at Marylebone Station, and went on to attend the Golden Jubilee luncheon of the Institution of Locomotive Engineers. Later in the day, the Minister and Mr. Williams visited the works of J. Stone & Co. (Deptford) Ltd., and in the evening attended a Government Reception in honour of the visiting Minister. Lord Nelson of Stafford entertained the visitors to dinner. Yesterday, the Malayan Minister visited the Vickers Aviation works at Weybridge, and in the afternoon were among the guests at the Royal Garden Party. The Minister and his party were entertained to dinner by the Minister of Aviation, Mr. Peter Thorneycroft, with whom they also attended a performance at the Royal Opera House, Covent Garden.

Today, the party is visiting the works of Dorman, Long & Co. Ltd. at Middlesbrough, and this evening, after returning to London by air, will leave for Scotland by night sleeper where they will be the guests for the weekend of Mr. R. Arbuthnott, Director of the North British Locomotive Co. Ltd.

On Monday next, the Malayan Minister and Mr. Williams will visit the headquarters of the British Transport Commission, where they will be met by the Chairman, Sir Brian Robertson, and officers of the Commission. Arrangements are being made for the Minister to have discussions with senior officers of the Commission on any railway subjects which he considers will be helpful and useful to him. He will also be shown films dealing with the British Railways modernisation plan, and later will be entertained to lunch by the Chairman and members of the British Transport Commission. In the afternoon he will

see the Stratford diesel depot and repair shops, and in the evening he will travel by the Blue Pullman Express to Manchester.

On Tuesday, he will visit the Associated Electrical Industries Limited's works at Old Trafford, and the English Electric Co. Ltd. is arranging a visit to the Newton-le-Willows works in the afternoon; for the next day the hosts to the party will be Steel, Peech & Tozer Limited. They will stay at the guest house of the United Steel Companies. While in that area they will visit several works, including that of Cravens Limited, and on Thursday a special train will be placed at the disposal of the Minister and his party for a visit to Crewe to inspect the Manchester-Crewe electrification scheme. The party will also visit Birmingham and will see the Witton works of the General Electric Co. Ltd., and those of Metropolitan-Cammell Carriage & Wagon Co. Ltd.

During the weekend Mr. Williams will be the host of the Minister at Torquay, and on Tuesday before leaving London Airport, at the conclusion of his stay, the Minister will attend a dinner given in his honour by the United Kingdom Railway Advisory Service at the Savoy Hotel. Special arrangements are being made to entertain the Minister's wife.

The "Locomotives"

THIS year marks the fiftieth anniversary of the founding of the Institution of Locomotive Engineers and the important occasion is being celebrated in London this week.

Elsewhere in this issue will be found some notes on the Institution's history. The story of the first 40 years has been contributed by Mr. H. Holcroft, who has a long and distinguished connection having joined the Institution in 1918. Mr. Holcroft has attended the council meetings for 35 years, which in addition to placing him in a unique position to write on the Institution's history, must also rank as a record of service to an engineering institution. To him the Institution owes much for he was also Honorary Editor of the Journal for 12 years, and a Vice-President for two. The last decade is covered by notes contributed by Mr. G. T. Hart, who has occupied the position of Secretary since 1949.

The Institution has long since attained a world-wide reputation and the influence of its work has been far-reaching. The list of those who have served it in various capacities is indeed impressive, and includes most of the great names of British locomotive engineering—and many of those from overseas—in the period since the foundation.

The addresses and papers which have been presented have always been of a high order. The journals have been well produced and contain a wealth of information which is not to be found anywhere else. Many august names, including a large number from abroad, are to be found among the authors, and the subjects cover nearly all aspects of locomotive, carriage, wagon, and ancillary equipment. A study of the titles of papers and addresses reflects the changing trends; in the current syllabus of general meetings one will look in vain for a reference to the steam locomotive. The Institution's proceedings have done far more than record development for they have played an important part in influencing it.

Visits to places of interest take place regularly. These, in the case of summer visits, have often been abroad. The contacts made on these occasions have done much to further the international exchange of information on design, practice, and performance. They have done much to make for better understanding between engineers. If the harmonious relations extant between railway engineers also existed between politicians, there would appear to be more hope for the world.

To celebrate the Institution's jubilee an attractive programme was arranged. On May 10, following a reception by the President, Mr. D. C. Brown, a luncheon took place at the Dorchester. In the evening the Sir Seymour Biscoe Tritton lecture, which is summarised elsewhere in this issue, was delivered by Sir Brian Robertson.

The day following there was an all-day tour to the West Country, including a visit to Longleat House. On the morning of May 12 an exhibition of locomotives and rolling stock will be held at Marylebone goods station. This exhibition, which will contain many outstanding examples, has been arranged by the British Transport Commission. His Royal Highness the Duke of Edinburgh will be received by the President and conducted round the exhibition. Later he is due to drive from the exhibition to Windsor in a "Warship" class locomotive.

An informal dinner and dance are to take place at the Dorchester Hotel this evening. At this, Mr. and Mrs. D. C. Brown will receive members and their guests.

The founders wrought better than they knew when they set in motion the moves which today have culminated in such a thriving Institution with a world-wide status. Locomotive engineers everywhere will join in the wish that the Institution will add yet further to its lustre in the second half-century, into which it now vigorously enters with such a record of achievement behind it.

The locomotive of the future

THE delivery of the Sir Seymour Biscoe Tritton lecture to the Institution of Locomotive Engineers, by an eminent member of the railway world, is always an important occasion. This is especially the case this year, when the Institution is celebrating its golden jubilee. The invitation to General Sir Brian Robertson, Chairman, British Transport Commission, to deliver the lecture was a particularly happy choice, for it enabled the Institution to pay a great tribute to Sir Brian, on the eve of his retirement.

Sir Brian, who chose as his subject "The Locomotive of the Future," commenced by saying that he appreciated the honour accorded to him in being invited to deliver the lecture. He had felt very shy in accepting the invitation, realising that he followed in the footsteps of men who had been great leaders of locomotive engineering. His was the modest contribution of one who has no claim to be technical, but perhaps some claim to define the requirement which technology in locomotive design and production must meet. For nearly eight years he had studied the future of railways in Britain and indeed in the world and the results of that study were reflected in the lecture.

Sir Brian described the background against which the locomotive of the future must be designed and added that it was not a background of roses. Nothing but the best will do. Sir Brian stressed that he set the requirement at a very high point. Nothing which he had to say was intended to be a criticism of what had been done in the past nor of what is being done now. It was a genuine attempt to forecast the requirement as he saw it, in the hope that it would be of help.

Cost and service are the joint criteria by which the best must be judged. It is not enough that a locomotive should be capable of hauling trains of given weight to specified schedules, it must also be capable of doing this very reliably over the years at low cost. The present initial cost of a high-powered main-line diesel locomotive is from three to four times that of a steam locomotive of corresponding power. Sir Brian's opinion is that this is too dear. In Britain it is not possible to arrange schedules so as to ensure that every main-line locomotive does a sufficient annual mileage to justify such a high price. Electric locomotives are relatively less costly but the electrification of a line takes a long time and is costly in itself.

Speaking of service it was said that the locomotive of the future must, in particular, be capable of rapid acceleration, consistently-high running speed, and effective braking.

Recent developments on the Southern Pacific Railroad would have attracted the attention of those present. There a determined effort is being made to find a locomotive which can produce the necessary power within a smaller compass, and at a smaller overall weight, than those which had been in use

hitherto. This is a very significant experiment, because it involves a radical departure from accepted practice on American railroads.

After dealing with the subject of availability Sir Brian said that he felt free to confess that, when the modernisation plan was embarked upon, the members of the British Transport Commission shared considerable apprehension about the reliability of high-powered main-line diesel locomotives. Their only experience to that date had been rather uncomfortable and they were aware that railways in other countries had encountered a considerable amount of trouble when they first embarked on a plan of dieselisation. The Commission's decision to have confidence in British engineers and manufacturers, to turn out locomotives that would not involve British Railways in a sea of troubles, had been justified. The standard of performance of our main-line diesel locomotives, taken as a whole, did them much credit. Having said that, Sir Brian went on to say that there is still room for improvement, but emphasised that a high proportion of the troubles experienced related to piping, tubing, gauges, electrical connections and so on. It was urged that members should do their utmost to ensure that the quality of design and workmanship applied to ancillary equipment should be quite as high as it is on aircraft.

Importance of appearance in design should not be forgotten. The Design Panel set up by the B.T.C. has fully justified its existence. Appearance is not a negligible matter from many points of view and is certainly important in the export market.

Sir Brian said that if it seemed that his remarks were all aimed at locomotive engineers and manufacturers he could assure the gathering that he had not forgotten the responsibilities of the traffic departments. There are many things which they can do to ensure that they get the best out of modern locomotives.

Freight-train braking, steam heating, and 50-cycle 25kV electrification were referred to. In connection with the last-mentioned it was pointed out that the conditions on British Railways are probably more exacting than on any other railways in the world and equipment which would stand up to them has passed the sternest test.

Concluding his lecture, of which this is a summary, Sir Brian said that he had striven as Chairman of the B.T.C. to promote a good relationship between engineers in B.R. and the manufacturing industry. This had been done not just for the sake of harmony but because it is in the interests of the railways. Sir Brian believes in the future of railways and, very sincerely, in the skill, efficiency, and integrity of British industry. If in the matter of locomotive engineering and manufacture they will work closely together, they will surely face their respective competitors with complete confidence.

Metropolitan railways and fares structures

PAPERS by three U.K. experts on the rôle of metropolitan railways in the world's leading cities under modern economic conditions, and on the economics of passenger fare structures, are being presented to the 34th Congress of the International Union of Public Transport which opened in Copenhagen yesterday and continues until May 17.

Mr. B. H. Harbour, a member of the London Transport Executive, was the author of a paper entitled "The place of the metropolitan railways in urban public transport," and Mr. R. M. Robbins, Chief Commercial & Public Relations Officer, with Mr. R. Postgate, Traffic Auditor, both of the L.T.E., jointly presented a paper entitled "Passenger fares: a consideration of the economic aspects of alternative fares structures."

In his introduction, Mr. Harbour stated that cities throughout the world are becoming increasingly aware of the potentials of metropolitan railways in dealing with urban problems. Almost without exception, those cities already possessing a metropolitan railway were enlarging or planning to enlarge it. One of the driving forces behind the recent wave of interest

undoubtedly was the "alarming" increase in the use of the private car, which was causing increasing congestion over large parts of city centres.

Principal reasons for the extension of existing systems or building of new ones were to give greater speed in travel, avoid street congestion, increase safety, and provide higher capacity. These reasons were taking over from the driving force behind original installations of political and prestige factors, the relieving of unemployment, and the need to free streets from tramway operation.

A number of metropolitan railways were built to foster suburban development, and this in turn had brought large population increases in the areas served. A more recent trend had been toward a population movement beyond the catchment area of a metropolitan railway. It was clear beyond doubt that commuter traffic needs could not be catered for in the largest cities without a metropolitan railway. There was evidence from Canada and the U.S. that a significant proportion of regular rapid transit and subway passengers on new systems previously travelled by car, and European cities now engaged on construction could hope for similar results. Had Paris not had its Metro it would either have had to accept only limited development and consequent loss of prestige, or the city would have had to be almost entirely reconstructed to provide roads with double the present capacity.

The extension of existing suburban railways had provided one of the most obvious alternatives, but monorails had not found much favour, although their use for special purposes such as providing a direct service from airports to central areas, as in London and Moscow, had been considered.

Extensions of existing systems already planned included taking the Paris Metro to the outer suburban population, and work on the Ligne Regional Est-Ouest was scheduled to begin this year. Toronto's second subway line was in course of construction; Osaka proposed to construct five new underground railway lines, and in Atlanta the backbone of the system was to be high speed rapid transit consisting of two branches using mostly existing main-line tracks. Los Angeles envisaged secondary down-town distribution of traffic by means of a semi-continuous and fully automatic system as yet undefined. Helsinki was studying the possibility of constructing an urban railway, and Milan's first line was due to be opened this year.

Mr. Hubbard went on to emphasise that experience clearly showed that in a very large city the metropolitan railway was essential for efficient movement of its citizens. Co-ordination with other railways and different transport systems, and with town-planning and highway authorities, was vital. Once the need for a metropolitan railway was firmly established and recognised, the place of the railway in a co-ordinated urban system was "right in the forefront," and it must be given a prior position with competition for traffic regulated in its favour. The metropolitan railway represented an important capital asset, and once built was not readily abandoned. Its service to the community justified consideration of financial assistance.

"Pessimism as to the future of public transport is not warranted," Mr. Hubbard declared. "If recent American practice is relevant elsewhere, as I believe it to be, an extension of an existing metropolitan railway, or the building of a new one, is likely to prove the mainstay of many a rejuvenated urban public transport system."

Reviewing the relationship of fares structure with the volume and characteristics of traffic carried, Mr. Robbins and Mr. Postgate pointed to the importance of geographical, social, economic, and historical factors which have influenced the choice and designs of the fares structures. The common type of urban passenger transport and operation in a city of over 1 million inhabitants involved mainly short-distance travel, characterised by sharp sudden peaks. The size and shape of the city was a primary factor in determining its fares system, and there was close relationship between the structure

and of a transport system and its operating policy.

Undertakings which aimed at maximum carrying capacity had simple fares structures, including simpler sectional systems. But how far such big capacity vehicles—as in Turin, where one vehicle seats 26 and carries 150 standing—would remain in the foreseeable future attractive to passengers was open to question with the growing ownership and use of private cars.

In both London and Paris, where there was unified control of all significant suburban urban transport operations, fares policy was used as an instrument to secure co-ordination, but this was achieved only with the help of a flexible variable, i.e. basically sectional fares method. There must be few urban transport undertakings which had not experienced a variety of social and political pressures powerful enough at times to exert a determining influence on operating and commercial policy. Lists of favoured categories were often long, complicated, and bewildering, ranging from war veterans to students, and from commercial travellers to children of large families. But very few operators welcomed such concessions. Most important was the fact that, with intense competition from television and private cars, they meant loss of valuable revenue. The real issue was whether such relief should be given in the form of fare concessions or through other channels.

Wide variations in the effect of fares structures on gross revenues were revealed by the authors' enquiries. In the case of cities of over 750,000 inhabitants, the very highest operating ratios seemed to prevail where a flat or zonal fares structure was employed, and also in some of the cases where a hybrid system was used. Conversely, it was very rare for undertakings operating in the same circumstances and using a sectional fares system to have an operating ratio in excess of 100.

In the operating conditions of a great city, and particularly in London, the adoption of flat fares could not be contemplated. The same consideration would apply to zonal fares or even a drastic simplification of the sectional system. The effects might not be so disastrous, but they would make themselves felt in no uncertain manner. This did not mean that there would be adverse effects on gross revenue by simplification of the fares system in all circumstances. But more and more undertakings were being attracted by the idea of more graduated fares structures. Almost 60 per cent of those answering the questionnaire had a sectional scale of one kind or another.

It had been argued that the really worth-while economies which flow from simple fares structures were those which facilitated the introduction of operation by one-man crews, but the question was very much open whether operating vehicles with one man would, in the long run, meet the requirements of passengers and therefore traffic maintenance. Advance sale of tickets in such cases was almost a pre-requisite of success.

Fares structures could not be considered in isolation. The closest links existed between the degree of refinement in charging, the capacity of the vehicle, and the standard of comfort. The interdependence of these factors was inescapable. With the increasing development of private car travel, the relative weight to be attached to each of these factors constituted the crucial issue before public transport operators today.

Pakistan railway centenary

ALTHOUGH Pakistan was constituted a separate Dominion only in 1947, and became a Republic as recently as 1956, the first railway in its territories will have completed 100 years of service tomorrow. This is the initial portion of the old Scinde Railway, which was incorporated by an Act passed by the Parliament of Great Britain on July 2, 1855, and which opened the 105 miles from Karachi (then spelled Kurrachee) to Kotri and the River Indus on May 13, 1861. The gauge was 5 ft. 6 in. a figure adopted as standard for railways on the Indian continent by the Court of Directors of the East India Company on the recommendation in 1850 of Mr. F. W. Simms,

its Consulting Engineer for Railways. This was a change of policy from the 4 ft. 8½ in. originally intended, and was a decision taken against the advice of Lord Dalhousie, the Governor-General, who advocated strongly the use of the 6-ft. gauge.

The whole of the northern provinces of the continent were dependent on the two natural channels of communication, the River Ganges and the River Indus, the former readily navigable and serving the port of Calcutta, but the latter restricted by shallow and shifting navigable channels, and lacking a good harbour. On the initiative of Sir Charles Napier, the port of Karachi was developed, and Mr. H. B. (later Sir Bartle) Frere, Commissioner for Scinde, proposed the railway to Kotri, to avoid the tedious and treacherous navigation of the Indus Delta. Sir Bartle turned the first sod on April 29, 1858. While the line was being built, a more comprehensive scheme of development for linking the capitals of the North-Western Provinces was evolved. This comprised three further undertakings, namely, the Indus Flotilla Company (a steam service on the river between Hyderabad and Multan), the Punjab Railway Company (Multan to Lahore and Amritsar), and the Delhi Railway Company (Amritsar to Chazibad, opposite Delhi). The concessions to these three companies were granted in 1859, and, although they were separate legal entities, all were under the management of the Scinde Railway Company. They were absorbed by the Scinde Railway by Act of July 12, 1869, and the amalgamated undertaking became the Scinde, Punjab & Delhi Railway. The river section did not prove adequate, and the Government built and worked the rail link between Kotri and Multan as the Indus Valley State Railway. Another Government enterprise was the Punjab Northern State Railway, between Lahore and Peshawar. The Scinde, Punjab & Delhi Railway was purchased by the Secretary of State for India in 1885, and was amalgamated as from January 1, 1886, with the Indus Valley, the Punjab Northern, the eastern section Sind-Sagar, and the southern section Sind-Pishin State Railways to form the North Western State Railway. The total of 1,850 route miles in 1886 rose to 3,005 miles at the end of the century : 4,011 miles in 1914 ; 5,195 miles in 1929; and 6,298 miles in 1932.

This great railway, the largest system in India, had a total route length of some 6,900 miles at the time of Partition, of which about 5,000 miles formed the North Western Railway of Pakistan. The title has been changed within the last few weeks to the Pakistan Western Railway, and the latest available statistics show a route length of 5,334 miles, of which 4,635 are of the 5-ft. 6-in. gauge, 381 miles of 2-ft. gauge, and 318 miles of metre gauge. It serves an area of 310,000 square miles, and a population of about 39 million. There is no electric traction, but steam locomotives (at present totalling some 702) are being replaced by diesel-electric units, of which there are at present 176. Coaching vehicles total 2,986, and goods wagons 29,851. Eastern Bengal, which is separated by the width of the continent, is served by a much smaller railway, necessarily detached from the main system. Until recently it was known as the Eastern Bengal Railway, but has now been re-named the Pakistan Eastern Railway. This has a total of 1,712 miles, of which only 546 are of the broad gauge, 1,146 miles of metre gauge, and 20 miles of 2-ft. 6-in. gauge. The original Eastern Bengal Railway Company was incorporated by an Act of August 25, 1857. About 46 miles were opened from Calcutta to Ranaghat on September 29, 1862, but this section is not in modern Pakistan. A further 61 miles, from Ranaghat to Poradaha and Jagati, was brought into use on November 15, 1862, and part of this is in Eastern Pakistan. The system was acquired by the State on July 1, 1884. After the acquisition by the State of the Assam-Bengal Railway at the beginning of 1942, the combined system was designated the Bengal Assam Railway. At Partition, the portion in Eastern Pakistan reverted to the title Eastern Bengal Railway, which it used until the present year. The Centenary of Railways in Pakistan is to be celebrated in October.

LETTERS TO THE EDITOR

THE EDITOR IS NOT RESPONSIBLE FOR THE OPINIONS OF CORRESPONDENTS

NEW YORK CENTRAL RAILROAD

May 8

SIR.—In your May 5 number, an article on the January losses of U.S.A. railways mentioned the New York Central's deficit of over \$6 million. Its 1960 report just to hand shows the Central struggling valiantly in adverse conditions. Its President, Mr. Alfred E. Perlman, is not downhearted though last year gross revenues fell by 2 per cent to \$675 million, the lowest figure since the war save for the lean year 1958. Operating expenses were cut by \$9 million, or 1·6 per cent, but the operating ratio crossed the danger line from 83·7 per cent to 84·2. Equipment and joint facility rents cost \$5 million more, nearly 25 per cent, and earnings before charges dropped by nearly a third to \$16 million. The Central was left with a net income of \$1 million, compared with \$8·4 million in 1959.

Against these setbacks, Mr. Perlman points to a continuous reduction in passenger train deficit to \$17·8 million, 66 per cent below the 1957 deficit of \$52·3 million. He also indicates that the Central is proceeding with its programme of betterments on which \$320 million was spent in six years. In 1960, a "fourth new push-button yard" was opened at Indianapolis and at once saved a day in transit from the east coast to St. Louis. A similar yard is being planned at Detroit. Meanwhile, 1,470 miles of central traffic control are in use and doubled freight train speeds, so that gross tow-miles were produced in a train-hour at an all-time peak of 59,400.

Last year the average number of employees was curtailed by 4,566, over 1 per cent, and their remuneration in the same proportion, but retirement and unemployment insurance taxes totalled \$30·7 million. Mr. Perlman's advice to shareowners was to demand a sound transport system as the keystone of the United States economy.

Yours faithfully,

R. BELL

Clacton-on-Sea

NORTHEY EXHAUSTERS

May 3

SIR, In your issue of April 14 appears a description of the Yorkshire Engine Company's diesel-hydraulic locomotive incorporating a Northeby Type 125 RE vacuum-brake exhauster driven by a Lister diesel engine; on page 422 on the drawing of the locomotive you indicate the position of the "Northeby-Boyce" Exhauster. Strictly, this is a misnomer, the term should be simply "Northeby Exhauster."

The history and present position of this now well-known exhauster are of interest. Northeby-Boyce exhausters were first made by the Northeby-Boyce Rotary Engineering Co. Ltd., a company which was formed about 1935. Originally, the office and place of manufacture was here in Parkstone, but in 1938 manufacture was transferred to Sheffield under the aegis of Metropolitan-Vickers at its Attercliffe Works, and Northeby-Boyce, as such, became, in effect, an office and drawing office there.

With the coming of the war it became more or less impossible to sell these units, and the Northeby-Boyce Rotary Engineering Co. Ltd. simply faded away, but production of the railway exhausters and industrial-type "oil free" compressors and vacuum pumps was continued by Metropolitan-Vickers at Sheffield for its own requirements and for those customers who had appropriate priorities under Government licence. During the war Metropolitan-Vickers manufactured under full licence quite a few such units for Imperial Chemical Industries, and Northeby-Boyce railway exhausters were incor-

porated in locomotives for the South African Railways, among other railway systems.

After the war, Mr. A. J. Northeby, the original inventor of the Northeby principle of operation, approached Metropolitan-Vickers, which had ceased to manufacture Northeby-type units, and manufacturing agreement was concluded with this company, Northeby Rotary Compressors Limited, which was founded in 1946 and began operations by meeting the demand for repeat orders from previous industrial users.

As a result of further negotiations arrangements were subsequently made whereby all records and component stocks were transferred from Metropolitan-Vickers to Northeby Rotary Compressors which now is the only manufacturer of Northeby units, which are Northeby, *not* Northeby-Boyce. The company's own units for traction purposes are designated Northeby Railway Exhausters and there is no connection whatsoever with the word "Boyce."

Compared with the old Northeby-Boyce exhausters the design has been improved considerably; it is not only a better unit but doing the work better as well. Northeby exhausters are being fitted in increasing numbers to locomotives for British Railways and for overseas use. Another point of interest is that there was never a Northeby-Boyce Exhauster of the same capacity as the present Type 125 RE (i.e., 125 cu. ft. per min.); there was one of 90 cu. ft. per min. and another of 180 cu. ft. per min., but not a middle unit of 125 cu. ft. per min, nor was there ever a compact flange-mounted lightweight unit such as can be obtained today.

Yours faithfully,

W. B. THOMPSON
Managing Director

Alder Road, Parkstone,
Poole, Dorset

RAILWAYS INTO ROADS

May 4

SIR, In your issue of April 21, Mr. A. W. T. Daniel questions how much land can be spared for motorways. Those so far built have kept to rural areas where the cost and difficulty of acquiring land is relatively small but, if the growth in the number of motor vehicles continues as expected, urban motorways may soon become an urgent necessity. The value of townland occupied, at today's high prices, and of the property to be demolished will reflect itself in construction costs measurable only in terms of £ millions a mile.

Even a modest motorway network is likely seriously to affect the railways' competitive position and, in trying to stem growing losses, more and more secondary main lines may be closed. It would be ironical if the construction of motorways, at inflated cost and with considerable inconvenience, were to be followed a little later by abandonment of broadly parallel railways whose redundant land would often be difficult to re-develop because of the extensive earthworks on it.

Railway routes penetrate deep into every centre of population and industry and their use as a basis for motorway construction would avoid much of the wastage of physical assets otherwise likely to occur.

How far to go in providing sufficient road space to meet the aspirations of potential car commuters is a problem vexing most large cities and, if 90 per cent of London's commuters were to travel by car, as in Los Angeles, the number of traffic lanes required would greatly exceed that which railway conversion alone could provide. Although this implies a continuing major role for public transport, it does not necessarily follow that railways are making their most effective con-

tribution in their present form. One benefit of conversion would be to increase their carrying capacity at existing formation widths, because road public transport vehicles accorded high, if not complete, priority during peaks could carry passengers over a single traffic lane at much higher rates than that of five per second mentioned by Mr. C. Hamilton Ellis in respect of two railway tracks. Double-deck vehicles of 100 or more seats capacity should have no difficulty in passing passengers over a reserved lane, with lay-bys at stations for overtaking, at rates of 10-15 passengers per sec., if necessary.

To offset an apparently inevitable decline in the long-distance movement of coal, from which so much revenue is derived, it would seem urgently necessary for the railways greatly to increase their general merchandise traffics. A survey among "C"-licence vehicle operators has shown that the greater "speed and certainty of timing" possible with their own vehicles is the principal reason for not using railway services. Conversion would result in highly reliable door-to-door transits for full vehicle loads being regularly accomplished at throughout speeds of about 40 m.p.h., or rather less than 4 hr. for the average railway merchandise haul of 134 miles. Competition on level terms with other road vehicle operators should put the principal national carrier in a much stronger relative position than now.

There should be ample scope for high-capacity freight vehicles "tied" to the converted network, for some 95 per cent of railway freight tonnage originates in private sidings; 74 per cent has its destination there, and much of the remainder, including domestic coal, is unloaded in railway yards.

Yours faithfully,
BENBOW

129, Sunnybank Road,
Potters Bar, Middlesex

WINNING BACK RAILWAY PASSENGERS

April 21

SIR, I expect there are other retired railway officers like myself who, although still active in outside industry, seldom visit our old colleagues or express our railway views because we dread the accusation of being interfering old busybodies. Furthermore, after many years of service in vast industries, one becomes more and more imbued with the shortcomings of one's own knowledge and with the fact that there always seems to be an answer to dispose of almost any viewpoint.

Such thoughts deterred me from sending you a letter I had drafted after reading the report on Mr. John Hay's speech in your issue for February 17, but now that Mr. D. W. Mountain, in your April 14 issue, has re-kindled my fervour about what I call a certain generation of people lost to the railways, I have been emboldened to do the thing I have always refrained from doing—writing to the Press. It seems to me that, in his enthusiasm for leaving the customer to choose his own form of transport, Mr. Hay has overlooked the extent to which cost dictates choice, and, with passenger transport, in countless instances contrary to the real wishes of the customer and often considerably to his or her inconvenience. It seems not so easy to evade responsibility for users' habits or the effect of those on the various nationally-owned undertakings, and if, by any chance, the charges structures are largely deciding the public's choice, then the Government and its agents, of which the Commission is one, might be adjudged inevitably to be doing, possibly unwittingly, just those things which Mr. Hay decries. Furthermore, not only would a big difference in charges be in danger of creating a false impression of the size required for any activity, but to keep the revenue in watertight compartments appears to deny the Commission or its successors the right to vary the charges of one activity to assist the solvency of the whole. I have in mind that if—as might prove inevitable if each form of transport is to be used to the best advantage—the charges must be more closely related, an appreciable increase in certain road charges, or a decrease of some rail charges, might

have the effect of increasing revenue and decreasing costs.

In my new rôle, since retirement, of a transport user, I have seen more closely this payment factor at work with both freight and passenger traffic. With the latter, I am reminded particularly of my misgivings when in railway service, that the prosperity of the coach companies was founded on the disregard in the railway fare structure of the "period" passenger. There must be good reasons for the continued withholding by the railways of any concession for the major part of the year to those passengers but, in view of the extent to which people returning the same day can travel by train at reduced rates, in many cases at fares cheaper than the coach fare, the difference in the treatment of the period passenger still seems remarkable.

One wonders whether it is fully appreciated that this situation may be largely responsible for the growth of a section of the public which always travels by coach and never by train.

This latter development may be brought home more forcibly to those who, like myself, live in the country and traditionally know more about how our neighbours live. A large coach station in one's home town does nothing to lessen the impression. If one visits it and asks passengers why they travel by coach, the answer is always that it is so much cheaper. The penalty of being a period passenger, for a person in our town travelling by rail, say, to London, is a fare just on £1 more than the rail "day return," 33s. more than, or nearly three times, the "half day," and 29s. 6d. more than, or two-and-a-half times the coach fare.

Coach passengers may well be those for whom the time factor is not critically important, but there can be little doubt that a fare structure providing such wide margins must play a big part in influencing people's choice of transport.

Before the war the weekend fare went quite a way to meet the situation. Since then, period passengers have been "outcasts" so far as railway cheap-fare specialists are concerned. I used to feel a mixture of sympathy for them and a keen desire to get my hands on the revenue they could provide. In fact, to be able to examine the possibilities of providing a more equitable fare structure, and one favouring the railways by lessening the inducement to travel by coach, I arranged, before nationalisation, and when it was therefore not so wicked to do so, for our local coach station to be watched, and for the coach-loadings to be compared with actual rail bookings on parallel routes.

The results were most interesting. The better use of "off-peak" trains was one important factor in our minds, and it seemed essential to have a basic or standard fare similar to the coach fare which the public would know would always be available on all but the "peak" trains.

We calculated the loss which the reduction to the coach fare for passengers already travelling on "off-peak" trains would produce. We then established that coach passengers on parallel routes were sufficiently numerous to ensure that these losses would be overtaken by the transfer, in sufficient numbers, of these people to a service, at the same fare, lopping off an hour or two of the journey time and providing the amenities associated with corridor trains and, in some cases, dining cars. We also suggested a surcharge of 5s. per 50 miles more than the corresponding coach fare for the remaining trains, the "peak train" category.

This again reduced the period fare, but the amount of the reduction was less than the increase resulting to the "cheap day" fare. The "cheap day" tickets provide a large percentage of the revenue at many stations and, having regard to the class of passengers involved—largely businessmen on expenses—it was not thought that numbers would be affected, but that crack trains would earn appreciably more. Furthermore, many businessmen (who cannot select their days of travel) would gain, because the fare would be a daily one. Businessmen are still mystified when, as often happens, they travel on successive days at vastly different fares.

Taking my own town, 121 miles from London by rail, the situation based on existing rail and coach fares would become:—

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I do not think that the rail revenue would be subjected to serious hazard, as there are so many areas today where travel with "half day" fares as cheap or cheaper than coach fares can already be achieved on three or four days a week. The crack trains on which "day cheap" fares are given three or four days a week might well earn considerably more, and what risk there is seems to be largely confined to the revenue from the return passenger staying longer than one day. Would coach passengers transfer in sufficient quantity to offset the loss on fares paid by existing travellers?

Very occasionally, the opportunity is afforded of obtaining an assessment of the inroads into rail revenue represented by these lost generations who have transferred seemingly permanently to the coaches. One such occurred in our locality last winter, when the roads over the Cotswolds became ice-bound on a Saturday. A member of my staff who had worked with me years ago on our experiment telephoned me to tell me of the number of passengers directed to the trains from the coach station. Our "off-peak" London trains must have been very profitable on that day.

My friend also spoke of the positioning of many vans in the freight yard to convey traffic normally carried by British Road Services. This was first-class co-operation, but is there a case for the periodical discussion of how this kind of co-operation could be turned regularly to advantage? One swallow does not make a summer, but perhaps an enquiry might be made into the direction being taken by open competition between the Commission's activities. I am thinking of a case in which a firm sending about 1,000 tons of traffic a month all over Great Britain by B.R.S. enquired for a rail rate taking into consideration the savings the Commission would achieve on the road. Admittedly an unusual request, but the answer was unusual enough to indicate that there may be good reasons for not just disposing of this charging problem by sitting down in the belief that the customer will, by his own free choice, be the architect of the future pattern of transport.

Apart from the possible manipulation of charges to obtain more net revenue, other things strike the "provincial" as strange, no doubt because of our lack of knowledge. Instead of joint cartage, maintenance and administration, more and more competition between the Commission's activities seems to be the order of the day.

My life is now spent largely with industrialists among whom I am detecting an increasing confidence in British Railways and a disposition to wish them well. My new friends are particularly appreciative of the business passenger services. They are also beginning to see in the railways the only medium capable of making an impact on congested roads.

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One would have thought that the integration of services to gain the ends to which I have referred would have justified a special organisation to achieve it. Or at least that one of the successive committees of inquiry would have dealt more specifically with this problem and, perhaps, the humbler one of the impact of the various activities' charges on the fortunes of the whole.

It would seem that, as possibly may be the case, consideration of such problems should have preceded any discussion about the future most suitable organisation. I have often been surprised at the extent to which all the inquiries, pronouncements of ministers, readings of papers, speeches, and so on, appear to be aimed at railway activity, seeming to condemn it not only as a black sheep of the family, but also to a life in isolation as if "sent to Coventry" by the other members. This is quite contrary to the outlook of prenationalisation managements, which were developing road transport on an increasing scale to tap the countryside to feed the trains, but would have frowned on any form of protection aimed at perpetuating long-distance road services provided by their own vehicles, except where the customer demanded it.

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Locomotive movements

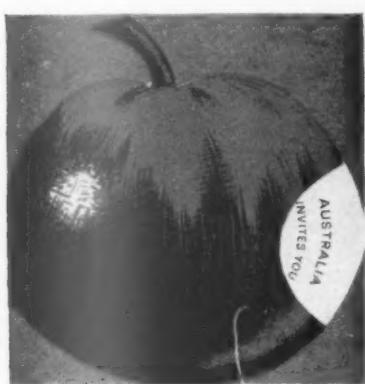
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OVERSEAS RAILWAY AFFAIRS

FROM OUR CORRESPONDENTS

VICTORIA

Improved Easter traffic

The Victorian Government Railways carried more than 66,000 passengers from the Wednesday before Easter to the following Tuesday. Inter-state and country trains carried 60,660 passengers and 6,000 passengers travelled to the nearer country places. Interstate passenger traffic increased by 12 per cent, and the overall increase both interstate and Victorian was 1½ per cent compared with the previous Easter.

Station parking

To overcome the problem of non-train travellers using railway station car parks for free all-day parking, the Victorian Government is introducing legislation. The railway areas will be reserved for use only by train passengers' vehicles, and for those delivering and collecting goods carried by rail. Victorian Government Railways will be authorised to erect signs setting out conditions for parking. Parking offenders will be liable to the same penalties and procedures as those parking illegally on streets.

Upper Ferntree Gully construction

Construction of the extension of the Melbourne electric suburban system from Upper Ferntree Gully to Belgrave is proceeding satisfactorily. Work is in hand on the earthworks and concrete substructures of overbridges, on station-

building and platform foundations, and on ballasting. A short length of track has also been laid. At Upwey the old timber main road overbridge has been replaced by a steel and concrete structure 110 ft. long. Most electric trains now terminating at Upper Ferntree Gully, will be extended to Belgrave. The new broad-gauge line follows approximately the first three miles of the previously-abandoned narrow-gauge line, extending 18 miles into the Dandenong Ranges, but unlike the old line there are no level crossings on the new one, road crossings being replaced by under- or over-bridges.

COLOMBIA

New locomotives on order

The new locomotives under order from the General Electric Company, referred to on the Contracts and Tenders page in this issue, are expected to be used on the 625-mile Atlantic Railway, at present under construction. This major rail line will join the two isolated railway systems of Colombia into one network. The locomotives will be equipped with dynamic brakes for operation over the mountain grades encountered on the run from the coast to Bogota. All 15 of the locomotives will be operable in multiple-unit combinations either with each other or with other General Electric locomotives now in service. The new Atlantic Railway, traversing the Magdalena River valley, will link Colombia's

port of Santa Marta with Bogota, the capital, and connect with the line to the Pacific coast port of Buenaventura.

U.S.A.

Railway unions' demands

The U.S. railway unions are trying to secure a form of guaranteed annual wage. The proposals containing the demand were presented to the Presidential Railroad Commission by Mr. Eli Oliver, economist, for over 200,000 locomotive engineers, firemen, brakemen, conductors, and switchmen who are organised into separate unions. Other requirements include a shorter working week, weekly and monthly wage guarantees, and "displacement" pay for employees laid off because of mergers and abandonments.

FRANCE

New double-deck motorcar carrier

The Société Nouvelle des Ateliers de Vénissieux recently supplied the Société de Transports de Véhicules Automobiles with a new type of two-tier vehicle intended for the transport of both accompanied and new motorcars. It is adapted to the needs of present running conditions as regards suspension and braking and can therefore be used on fast trains running at 87 m.p.h. Ten cars of average dimensions can be carried. The extensive area of the lower deck and the absence of uprights along most of its length permits loading of two lines of two vehicles of average size plus one at each end, making six vehicles, three larger vehicles in one single longitudinal file, two large American-style vehicles or a combination of various models.

DENMARK

Automatically controlled trains

A new system of automatically controlling trains is now in use on the mainline over Funen from Nyborg Ferry Station over the local capital Odense, and the junction of Tommerup to Aarup. Each train leaving Nyborg or Aarup is given a special code, and this code directs the signals and points ahead of the train. In this way all overtaking on the double-tracked line is automatically arranged, and it is only in an emergency or in case of a breakdown that the CTC office in Odense goes into the signalling.



Société Nationale des Chemins de Fer Français double-deck car transporter

The Institution of Locomotive Engineers

THE Institution of Locomotive Engineers, which celebrates its Golden Jubilee in May, 1961, has in the course of years become one of the foremost of the institutions specialising in particular branches of mechanical engineering. Its prestige is high, its influence world-wide, and the Journal of Proceedings issued in six parts each year is an authoritative and up-to-date means of conveying to its members everywhere the latest developments in the construction of all kinds of rolling stock and its movement by many forms of motive power.

The Institution is known as a live and well-managed organisation governed by engineers from a diversity of occupations, both in the railway service and by others engaged in the manufacture of railway equipment by private engineering firms, together with representatives from the offices of consulting engineers. All points of view can be presented in Council.

Local centres

Local centres through Britain contribute much towards the value of the Institution's work, while branches overseas, semi-autonomous as regards their local affairs, conform generally to the rules and are therefore in step with London.

Until the 1890's of the last century, those taking up locomotive engineering as a career had little to widen their knowledge beyond what could be gained by becoming a pupil at one of the larger railway centres, or serving an apprenticeship in the shops and passing to the drawing office.

Formation of Railway Club

The Railway Club was formed in London in 1899 and among those who joined were L. E. Brailsford, of Croydon, and G. F. Burtt, of the L.B. & S.C.R. Works at Brighton. In the course of time they, and others more interested in locomotives, became dissatisfied with the very limited attention given to locomotives. This led to a break-away by a section of the members and they formed the Stephenson Society in 1909. Brailsford was Chairman and Burtt the Secretary. So energetically did Burtt go about his duties that the membership was raised to 75 by the end of 1910.

Cleavage began to appear: one section wanted a more technical approach to the subject to help them in their profession; the rest were content with a general interest in locomotives as such. Early in 1911 Burtt and the malcontents withdrew, leaving Brailsford to head the remainder,

whereupon the society was renamed the Stephenson Locomotive Society.

Burtt and his party were not large enough to set up a society at Brighton, such as those which existed at the larger railway centres, so they went further afield to recruit members from nearby railways. Also they looked for members from firms associated with locomotive accessories and firms of consulting engineers with railway interests.

The inaugural meeting was held in 1911, and it was resolved to proceed with the formation of an institution, which they modestly named the Junior Institution of Locomotive Engineers.

At first Burtt acted as the Hon. Treasurer but when the Secretary resigned shortly after, on going overseas, Frank Burtt assumed the dual post of Hon. Secretary & Treasurer in September, an office which he held for many years. Membership was, by this time, 52. The early meetings were held in St. Bride's Institute, London, E.C. On account of the readiness of seniors to become members it was decided to alter the title to the Institution of Locomotive Engineers.

Rise in membership

In 1912, Lawford Fry, the European representative of the Baldwin Locomotive Works, became a member and a paper by him attracted more attention to the new and rising Institution, with a further gain in membership. Fry became one of the most active members of Council and he placed his office at the disposal of the Institution for council meetings. He was the first Chairman of the Finance Committee and was instrumental in enrolling Henry Fowler (later Sir Henry), C.M.E. of the Midland Railway, who accepted the presidency for 1913.

In order to attempt to interest the Great Western in the Institution an invitation was issued to Swindon to send a small party to hear the reading of a paper and enter into the discussion upon it. At that period Swindon Works was like a fortress which no one could enter without credentials and no information as to what was going on inside was issued to the press or public except through official channels. The invitation was accepted with an exploratory end in view, to ascertain at first-hand whether the new Institution was one which should receive their active support. A few men were selected having experience in the subject under discussion

Origins, growth and attainments during half-a-century of continuing progress

and they were briefed beforehand as to the limits to what they could or should not say. The presence of visitors from Swindon at the meeting was too good an opportunity to miss for some of those present, not necessarily members, to buttonhole them and try to interest the visitors in the specialities of the firms to which they belonged, while others endeavoured to find out more as to what was going on inside the Works. After this badgering was experienced on a second occasion an unfavourable impression was created and Swindon withdrew into its "splendid isolation." The Great Western alone among the larger railways was not represented by members in the Institution for the next 20 years or more.

Heavy loss

It was a particularly heavy blow when Fry was recalled to the U.S.A., but fortunately Mr. W. A. Lelean, of Messrs. Rendel Palmer & Tritton came to the fore in outlining the plans for revision. In this the objects of the Institution were defined, and Rules and By-laws drawn up for the consideration of the Council. Application was made for Incorporation, which was forthcoming in 1915.

At this period meetings were transferred to Caxton Hall. Hitherto the activities of the Institution and papers read had been published in *The Locomotive Magazine* by arrangement, to save expense, but in 1915 it was decided to issue a journal instead.

Influence of first war

Activities were restrained by the 1914-18 war, but during this period preparations were made for coping with the resumption of full activity and the expected influx of new members. H. Kelway Bamber became Chairman of a small committee to plan the establishment of local centres throughout the country, and did great work then and in after-years in fostering and supporting these centres. By 1918 the council had formed a papers reading committee and a membership selection committee to facilitate business. Burtt was responsible for production of the Journal and latterly had the help of E. L. Ahrons.

M. F. Ryan, President in 1919, was during his term of office appointed C.M.E. of the Argentine Central Railway. After settling in to his new post he was

instrumental in establishing the first centre overseas, the South American centre at Buenos Aires in 1920. In that same year the Scottish centre was inaugurated at Glasgow.

Until 1923, council meetings were held under difficulties. The hiring of a hall enabled general meetings in London to be held, but there was no Institution office there and the hiring of a room for council meetings was an added expense. Firms in the Westminster area having members in the Institution would place a room at their offices at the disposal of the council, but this could not be arranged until their staff had departed in the evening.

In 1922 the venue of the meetings was changed to the former Engineers' Club in Coventry St., London, W., and council meetings were also held there.

In 1923 the point was reached when it was clear that the arduous duties of Secretary, Treasurer and Publisher had absorbed every minute of spare time in evenings, weekends and even holiday times, and that the limit had been reached under the conditions prevailing. The council decided that the time had come to appoint a full-time salaried officer to take over the duties hitherto carried on by voluntary effort, and to establish a London office.

Subscription dispute

The proposal which favoured increasing the subscription rate, met with opposition. The council was in a dilemma, as any move to carry out the committee's recommendations might lead to a loss in membership and income which would more than offset the increased subscriptions. Happily a recently-elected member, J. C. Sykes, came forward and offered to act as Hon. Secretary for a period of 12 months and to place his private office in London at the disposal of the Institution. This respite was gladly accepted by the council and the Registered Office of the Institution was transferred *pro tem* from Lewes to Denison House, close to Victoria Station. The question of a full-time salaried officer was referred back to the committee for further consideration.

Burtt himself put forward the resolution relative to change of secretariat. The Council placed on record in the Proceedings the sense of indebtedness of the members to Frank Burtt and elected him an honorary life member of the Institution.

With J. C. Sykes as Hon. Secretary matters ran more smoothly. He was *persona grata* with a wide circle of influential members and his suave bearing brought an added dignity to the Institution's meetings.

The routine work of the Secretary's office was carried on by his assistant, Miss M. G. Hann, and her devotion to duty, efficiency, and ability proved of great value to the Institution both then

and in the years which were ahead.

The change did not affect work on the Journal, as Burtt continued as publisher; he also remained Hon. Treasurer. The volume of the work steadily increased, and in particular very full and valuable papers with their discussions were contributed by the South American centre.

Committees

Sykes was instrumental in making better use of the committees of the Council set up for specific purposes, particularly as regards the finance committee, which was expanded into the Finance & General Purposes Committee, the Membership Selection, Papers Reading, as well as others of a transient character such as Dinner or Visit Committees. These added much to efficiency. At the end of the first year the question of a full-time Secretary was no nearer solution and Sykes offered to serve for a second, or as long as necessary after that.

The presidential office in 1925 was assumed by R. W. Reid, the first President to represent the rolling-stock activities exclusively, and his term of office had the effect of bringing this side of the mechanical engineer's work into greater prominence in the Institution's proceedings.

During the 1927-28 session the venue of meetings changed from the Engineers' Club to Denison House also, which housed the registered office of the Institution. Early in 1928 a centre was inaugurated in Newcastle-on-Tyne. In 1929, by which time the membership had reached 1,300, a centre was inaugurated in India and another at Birmingham to serve the Midlands.

The first days of 1931 brought a climax in the history of the Institution when it sustained a heavy loss in the death of the Hon. Secretary, J. C. Sykes, who had held this position since 1923. What had been intended as a stop-gap measure to tide over a difficult situation had stretched out over eight years, and this invaluable service had carried the Institution to a point when the employment of a whole-time salaried officer became practical at last. The work of the Institution had meanwhile grown to such an extent with the opening of further centres at home and overseas and by the increase in membership, that the occasion had to be taken to secure the services of a whole-time Secretary who would also undertake the duties that had so far been carried out by honorary officers appointed by the council.

Secretarial reorganisation

The Institution took over Sykes' office and with it the services of Miss Hann, who carried on with the routine work. The President in that year, H. Kelway Bamber, supervised the secretarial work and applications were invited for the post of Secretary. Major H. A. Harrison was appointed and entered on his duties in May.

A notable event on Major Harrison's assumption of office was the transfer of meetings from Denison House to the hall of the Institution of Mechanical Engineers at Storey's Gate, Westminster. While retaining their full independence the "Locomotives" gained added prestige by this association with the "Mechanicals." In 1933 the registered office of the Institution was moved to more spacious and convenient premises at 28 Victoria Street, Westminster, which it still occupies. By this time the membership had increased to over 1,400. Members in Western Australia inaugurated meetings at Perth and other places for the reading and discussion of papers, and by their initiative some valuable contributions were made to the Journal.

In December, 1933, the death occurred of W. A. Lelean, the immediate Past-President. He was ever zealous in raising the status and importance of the Institution in the engineering world.

In 1936 the death occurred of A. Morton Bell, Vice-President & Chairman of the Finance & General Purposes Committee, who had rendered most valuable service over a long period of years. This same month marked the completion of the first 25 years in the life of the Institution.

N.S.W. branch

In September, 1938, a branch was formed at Sydney, New South Wales, with H. Young, Chief Mechanical Engineer of the New South Wales Government Railways as Chairman.

At the annual general meeting in 1939, it was announced that Julian S. Tritton, with his brother and sister, had presented £500 to the Institution for the formation of a fund to provide a gold medal and premium, as a memorial to their father, the late Sir Seymour Biscoe Tritton, K.B.E., President in the 1926-27 session, who died in 1937. The lectures commenced in 1946.

It was decided to devote this award to a lecture to be given on a selected subject biennially and to invite some distinguished person, not necessarily a member, to prepare and deliver the lecture, to be known as "The Sir Seymour Biscoe Tritton Lecture." These lectures have proved to be a valuable contribution to the Institution's Proceedings.

At the outbreak of the second world war, it was announced that no papers would be read in London for the time being, but publication of the Journal would continue. It was agreed that the President, Vice-Presidents and members of council and committees should remain in office for the duration of the war, an arrangement terminated in 1944. The activities of the Institution were suspended other than for an annual luncheon each session.

The Secretary, with the Council's permission, accepted an appointment under

the Ministry of Supply and was released from his duties for the time being. J. Clayton, Vice-President, supervised the work during his absence. In 1941, Major Harrison resumed his duties, but owing to air raids on London it was decided to evacuate his office in Victoria Street, and temporary premises were secured at East Croydon. Although no papers were read in Great Britain it was possible to maintain a regular publication of the Journal through papers received from India, South America, and Australia.

Resumption of the reading of papers in London, during daylight hours, took place in the 1941-42 session. With the ending of the war the local centres resumed their meetings in the autumn of 1945, and the full activities of the Institution were resumed. Membership stood at 1,900 in 1946.

Miss Hann, who had been assistant to the Secretary for 25 years, retired on superannuation in 1947. The opportunity was taken to make a presentation to her in token of the Institution's regard for her valuable services.

In January, 1949, the South American centre closed down through force of circumstances after nearly 30 years of most valuable work. The difficulties and restrictions imposed upon members regarding meetings since the transfer of Argentine railways to state ownership were such that there was no longer any useful purpose served by continuing as a centre. On the other hand, the Indian and Eastern centre was little affected by the transfer of sovereignty of India from British to Indian hands in 1947, and continued to prosper.

Secretarial change

In June, 1949, Major Harrison, Secretary & Treasurer, tendered his resignation. Mr. G. T. Hart was appointed to succeed him but Major Harrison retained the Editorship of the Journal for a period of twelve months while the new Secretary accustomed himself to his duties.

The Western Australian branch sustained a heavy loss in the same month in the death of Mr. F. Mills, who was largely

instrumental in setting up the branch and in supporting its activities. The death occurred in August, at the age of 78, of Frank Burtt, Hon. Secretary from 1911 to 1922 and Hon. Treasurer from 1911 to 1931. In October of the same year the Institution lost another valued member in Colonel E. Graham, who was Member of Council for 25 years and served as Chairman of the Finance & General Purposes Committee from 1936 to 1946.

Overseas representatives

In January, 1950, it was decided to appoint a number of overseas advisory representatives to foster the general welfare of the Institution in widely-separated territories, in Africa and Australia in particular, and so form a useful link with the Council in London.

Major Harrison finally retired on superannuation in June. The Council placed on record its appreciation of the good work he had done during 18 years service as Secretary, Treasurer & Editor of Journal. The President for the 1950-51 Session, Mr. R. A. Riddles, Member of the Railway Executive for Mechanical Engineering, outlined in his address the future plans and prospects for motive power and rolling stock on British Railways.

February, 1951, completed the first 40 years of the Institution's life, and it marked the end of an era. Hitherto, the activities of the Institution had been largely centred around steam locomotives. The extensive adoption of electric traction and of diesel locomotives abroad began to have its repercussions in Great Britain, and the Institution had to remould itself to meet them.

The changeover from steam has had its repercussions throughout the railway industry and this in turn has had its effect on the Institution's membership. Whereas in years gone by there were sharp distinctions between the mechanical and electrical sides of locomotive and rolling-stock engineering, in recent years these differences have become blurred and engineers in any given branch of the profession have had to learn a very great

deal about the other branches. The effect on the Institution's membership is reflected not only by its growth from 1,876 at the beginning of 1951 to 2,238 at the end of 1960, an increase of 19 per cent, but its content also has changed.

The premier award of the Institution is its Gold Medal (instituted in 1946) for outstanding service to the science and practice of locomotive engineering. During the 10 years this has been awarded twice—to Mr. R. A. Riddles, C.B.E. (Past-President) in 1953 and to Sir William A. Stanier, F.R.S. (Past-President) in 1957. The Institution awards its Bronze Medal at rare intervals to corporate members for specially meritorious service to the Institution, this was awarded to the late Mr. W. A. Agnew (Past-President) in 1952, and to Mr. John Vidal, M.C. (Past-President) in 1958.

Technical visits and summer meetings have played a very important part of the Institution's activities and continue to do so. Strong support is always given to these functions by the members.

The annual luncheon, originally introduced as a war-time measure in lieu of the annual dinner, has grown in popularity over the years and is now regarded as one of the leading engineering functions of the year.

Miss J. M. Johnson, who joined the staff of the Institution in 1949, was appointed to the newly-created post of Assistant Secretary in 1952 and continues to hold this appointment.

Achievements

From a small beginning in 1911 the Institution has grown steadily over the years and has shown much enterprise and exercised increasing influence. The main object of the Institution, namely, "the advancement of the science and practice of locomotive engineering, by discussion, inquiry, research, experiment, and other means ; the diffusion of knowledge regarding locomotive engineering by means of lectures, publications, exchange of information and otherwise," has been and continues to be faithfully carried out as portrayed by the 50 volumes of its Proceedings.

EAST AFRICAN RAILWAYS & HARBOURS



"58" class Beyer-Garratt locomotive on goods train near Elburgon Station (Nakuru-Kisumu branch) of the East African Railways & Harbours administration

CARRIAGE AND RAILCAR BOGIES: their design and development—III

THE use of hydraulic dampers between axlebox and bogie frame has not always been successful. Friction dampers should not be ruled out at this point, particularly if these can maintain a constant damping force regardless of displacement velocity and mileage between major vehicle overhauls. Resonance conditions are encountered when the natural frequency of the system is identical with the frequencies of excitation. The latter is not constant and can be encountered over a wide range of speeds, while particularly fierce displacement velocities and accelerations can be encountered at higher speeds. With hydraulic dampers, resistance is proportional to piston-displacement velocity. While suitably-set blow-off valves will limit the maximum force likely to be transmitted at high displacement velocities, the dampers do not always meet the desired requirements because of the possibility of directly-transmitted shocks bypassing the suspension.

Load-sensitive damper

In addition, it will be desirable to reduce damping forces at frequency in excess of 1·4 resonance frequency. This suggests that, particularly with soft suspension and high total load/tare load ratios, a load-sensitive damper, the damping resistance versus frequency characteristic of which would follow the

Desirable features of a bogie; performance in multiple-unit trains; determination of axle parameters and limits of adhesion

by J. L. KOFFMAN, Design Engineer (Projects), Chief Mechanical Engineer's Department, British Railways Central Staff

shape of transmissibility curves, might be of advantage.

The use of dampers should not be regarded in terms of a cure against a wide variety of unexpected ailments—a kind of bogie antibiotic. They can be of appreciable assistance up to a point only. Beyond this, they can become an embarrassment. Thus, excessive damping of γ -nosing achieved by imposing damping forces along the Y-axis of the bogie bolster can increase the angle of α -rotation, leading to excessive swaying.

Bogie rotation

The amplitude and frequency of bogie rotation can become unpleasantly intense, particularly if insufficient restraint is provided by the body (Fig. 1). This can be the case if the body is supported by a well-lubricated small area, as is often the case with conventional bogie designs. The amplitudes and with them the accelerations of the bogie rotating about its vertical axis can then increase, this in turn leading to increased amplitudes of body oscillations particularly if, as is sometimes the case in this

country, the distance between the bogie centres plus the bogie wheelbase is very close to the wavelength of the sinusoidal wheel motion, i.e., 46·5 ft. + 8·5 ft. = 55 ft. and 58·4 ft. for new 1-in-20 3·5-ft. wheel sets respectively.

Practice in Holland

A certain amount of alleviation can be achieved by restraining bogie rotation by placing the body on a large-diameter centreplate as is done in Holland, the U.S., and in this country where the centreplate diameter is about 2 ft., or by supporting the body at its sides as is done in Switzerland, Italy, Germany, and France. Analysis of the rotational resistance imposed on 10 modern bogie designs shows that a displacement angle of 30 min. its value in terms of torque (ft. t.) divided by bogie weight (t.) \times wheelbase (ft.) varies between 0·02 and 0·06 when the body is carried by a conventional small-diameter central support, and 0·06 to 0·1 for bogies with large-diameter centres or side supports. The latter values have no adverse effect on tyre wear and should be aimed at.

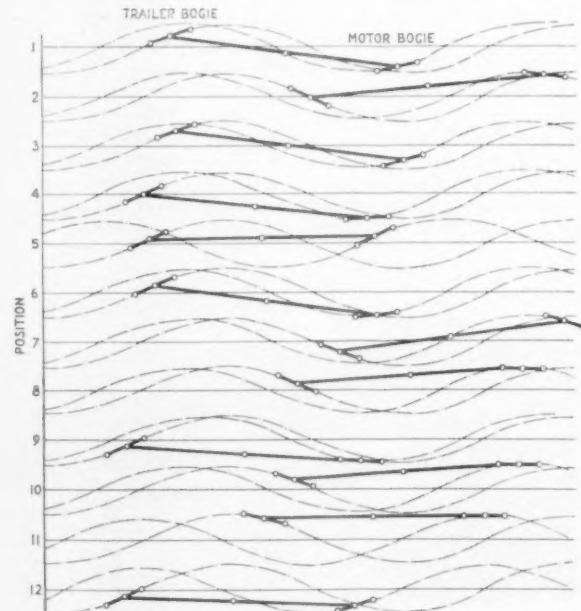
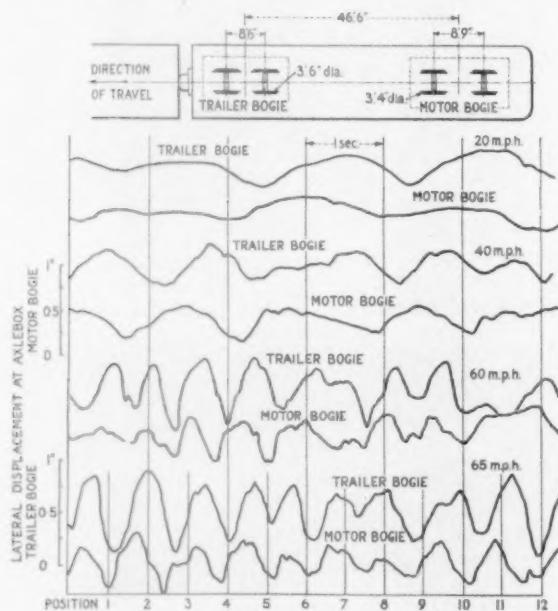


Fig. 1—Rotational motion of multiple-unit power car bogies and interpretation of 65 m.p.h. record

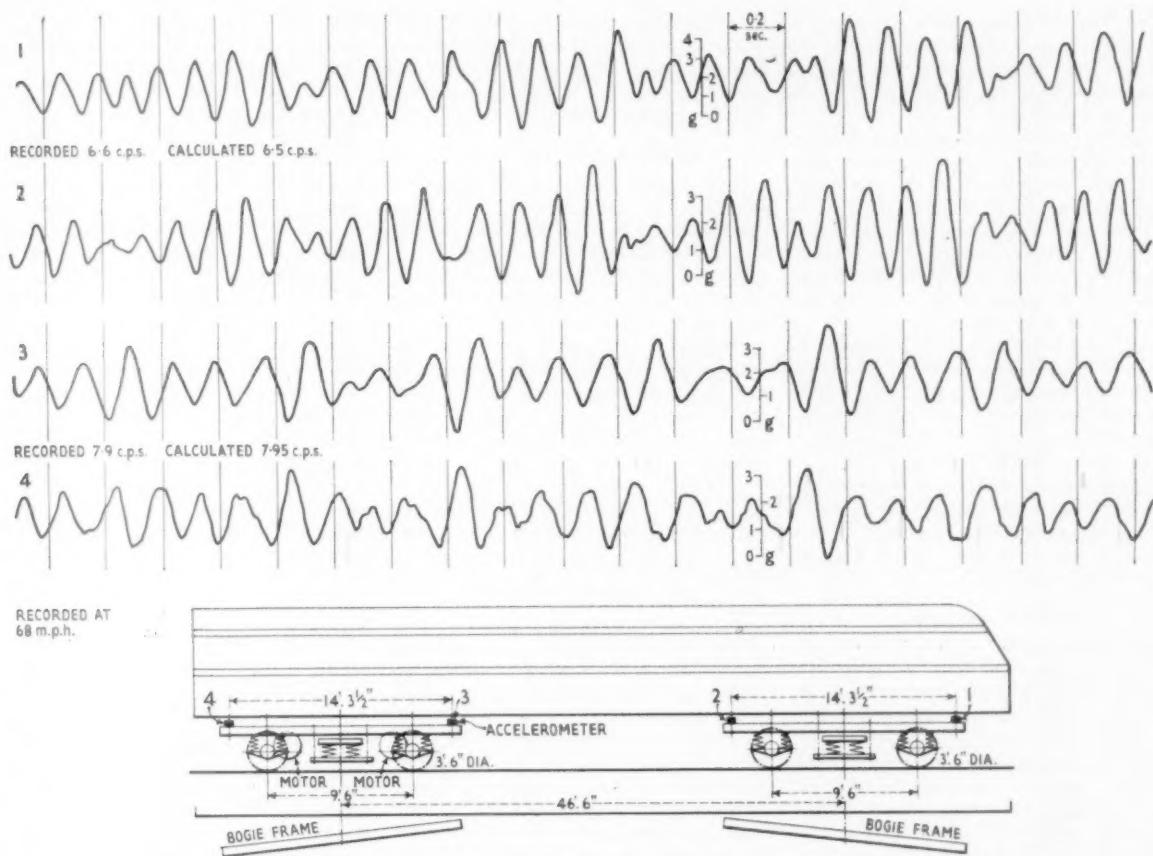


Fig. 2—Records of bogie pitching oscillations obtained by potentiometers across axlebox springs

The amplitude of bogie-pitching oscillations should be kept under control, for excessive amplitudes resulting in high accelerations and displacement velocities will also cause undue wear of the axle-guiding surfaces. In addition appreciable pitching amplitudes ($\pm \frac{1}{2}$ in. at 6 to 8 c.p.s.) can cause fracture of brake blocks applied at speed and rather violent fore-and-aft oscillations of the vehicle body ($X\beta$ -motion). This will be particularly the case if the body is linked to the bogies in a plane well above or below the Y-axis of bogie pitching.

Choice of elasticity

The resultant fore-and-aft (shuttle) forces can be further amplified (reference : transmissibility curves) by an unsuitable choice of elasticity at points of attachment. The choice of the elastic characteristics is also important so far as the rotational damping of the bogie oscillations about the Z-axis is concerned. Much effort has been made in this direction by suitably supporting the vehicle body on the bolster, by introducing pads with desirable friction characteristics in the case of central supports, and by controlled lubrication with side supports.

Traction rods securing the bolster to the bogie frame mounted close to the

longitudinal bogie axis (X) and provided with rather soft bushes at each end will permit the bolster to follow the body motion, thus reducing the desired damping, otherwise imposed on bogie hunting. In addition, undue flexibility at the points of attachment will permit excessive fore-and-aft displacement of bolster relative to bogie frame when stopping and starting.

The stability of traction rods against buckling should be checked in terms of a column hinged at both ends. The maximum force can be estimated on the basis of the requirement for coaches to resist a buffer load of 200 tons. For a normal British Railways coach body weighing 22 tons, this corresponds to a deceleration of about 10g. Thus, for a 6-ton bogie, maximum load at each traction rod will be 30 tons. Allowance should be made for the load not applied perfectly axially. A safety factor of at least 3.5 to 5 should be ensured. The rods must not be short, otherwise they might adversely affect the action of the swing links.

To prevent the traction rods from affecting adversely the effective swing link length they should be attached with the aid of spherical bushes.

The bogies, usually pitching at a frequency of 5 to 8 cycles per sec., can

excite the natural frequency of body structures, particularly with lightweight bodies, some of which have a frequency as low as 6 cycles per sec. Because of this, the natural frequency of bogie pitching should differ from the natural frequency of the body structure. The action of bogie pitching is shown in Fig. 2. In this case, the bogies tend to pitch in opposite directions at the same time, a condition likely to be encountered particularly if the bolster spacing is equal to a rail length minus the length of one bogie.

Ride index values

As soon as the main design features have been settled, it will be advisable to check the theoretical ride index values as a function of speed, damping factors, and tyre wear. If these values are unduly high, particularly at operationally important speeds, the design features concerned must be reconsidered. It should never be too late to do this, and due allowance should be made for the possibility of such a contingency in relation to estimations of design times.

Even the most effective matching of bogie design with vehicle requirements will not ensure the best ride for seated passengers if seats are chosen solely on the basis of static aesthetic-comfort con-

siderations. Yet they are mostly selected by "feel" in a stationary vehicle or because they were found satisfactory in buses or aircraft, under entirely different dynamic conditions.

As seats are responsible for a further degree of freedom between wheels and passengers, their dynamic characteristics must be considered in terms of natural frequencies and damping factors. Failure to do this can cause passengers to bounce unhappily on deep, well-upholstered, luxurious seats and write letters to the press about poor riding.

As indicated in Fig. 3, high values of seat oscillation amplitudes Z_4 resulting from incorrectly chosen frequency ratios and damping factors D can be responsible for unpleasant ride, despite efficient bogie design. Here, the use of suitable oscillating rigs will assist in determining natural frequencies and damping factors of load-carrying seats and thus permit desirable matching with vehicle suspension characteristics.

Effect of assumption

It will be noted that a number of assumptions must be made when designing a new bogie, particularly for a new, i.e., non-existing vehicle, and these may or may not prove valid. Apart from this, the complex interactions between various modes of bogie and body oscillations and the haphazard influence of track detract from the possibility of guaranteeing a completely satisfactory outcome immediately the first vehicle takes to the rails.

Because of this, novel ways in bogie design have been pursued with intermittent success. Frequently, if a design was not an instant success it was rapidly,

sometimes even gleefully, abandoned in favour of a slow evolution of an existing pattern, much to the detriment of the morale and prestige of designers and the undertaking concerned.

Design of prototype bogies

It is suggested that to encourage the evolution of designs and to reduce development time, prototype bogies should be designed to permit ready alteration of important characteristics. With this in mind, it should be possible to make provision for altering:—

1. Stiffness of primary and secondary springs, thus affecting frequencies of body and bogie pitching, angle of roll, and frequencies of swaying. It will be desirable to consider the range of possible variations in the preliminary design stage and to order a limited number of spring sets permitting a variation of static deflections. Considering the relatively low cost and the usually long delivery time of springs, such action will be fully justified by facilitating the final choice of design parameters.
2. The actual or effective length of swing links. With some designs, this can be readily achieved by extending the length of the link carrying brackets on the bogie so that two or three sets of holes are provided, permitting the use of two or three sets of links of different length. The link length range should be previously determined in terms of the effect on frequencies and amplitudes of the major modes of body oscillations, such as nosing and swaying. Thus, in the case of an electric locomotive bogie, it was possible to use links with an effective length of 18, 22, and 26 in. (second

half-tone illustration in part II of this article, published in this journal on April 21, last).

The latter value was desirable to ensure a low nosing frequency and reduced sensitivity to transient lateral forces, but appeared to be less advantageous as far as swaying was concerned. Provision for changing the swing-link length thus provides ready means for affecting riding quality in the lateral plane.

3. The characteristics of additional lateral centring devices. This refers to units with, preferably, non-linear characteristics, interposed between bolster or body and bogie frame. These will permit alterations to the lateral characteristics of the ride as far as amplitudes and accelerations are concerned, particularly when long swing links are used. Without the aid of such devices, the latter might demand unduly large amplitudes, i.e., clearances, while the large amplitudes might also result in poor riding characteristics.

Force-displacement characteristics

The range of possibly desirable force-displacement characteristics should be considered at the design stage and provision made to permit adjustment of the characteristics as the development proceeds. The importance of lateral characteristics, particularly at high speeds, is stressed by the fact that, for the same lateral deviation, resultant acceleration will be proportional to the square of the speed, i.e., at 100 m.p.h. it will be 2.75 times that encountered at 60 m.p.h.

4. The height of bolster fore-and-aft check-plates or traction rods securing

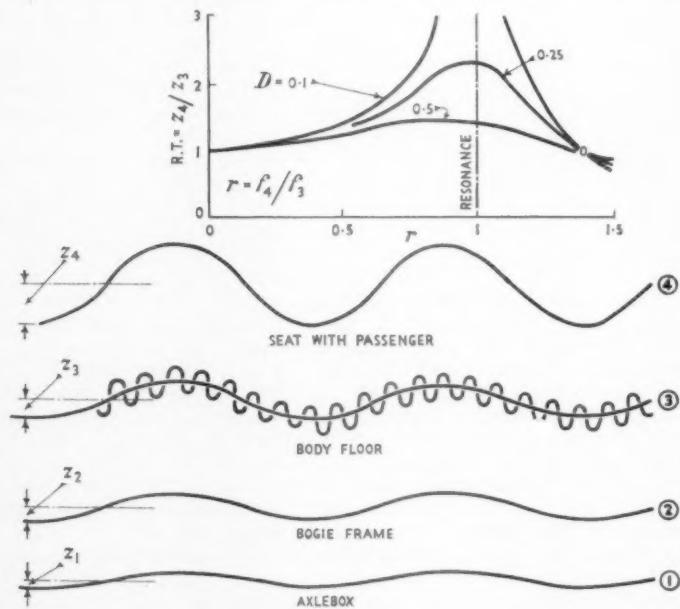
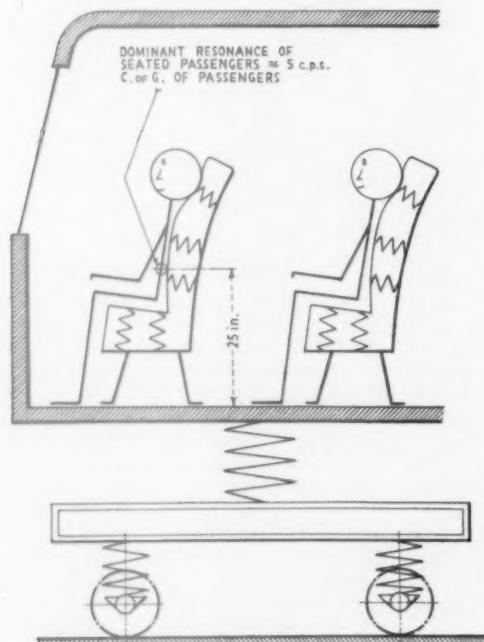


Fig. 3—Natural frequency and damping of seats are important for good riding

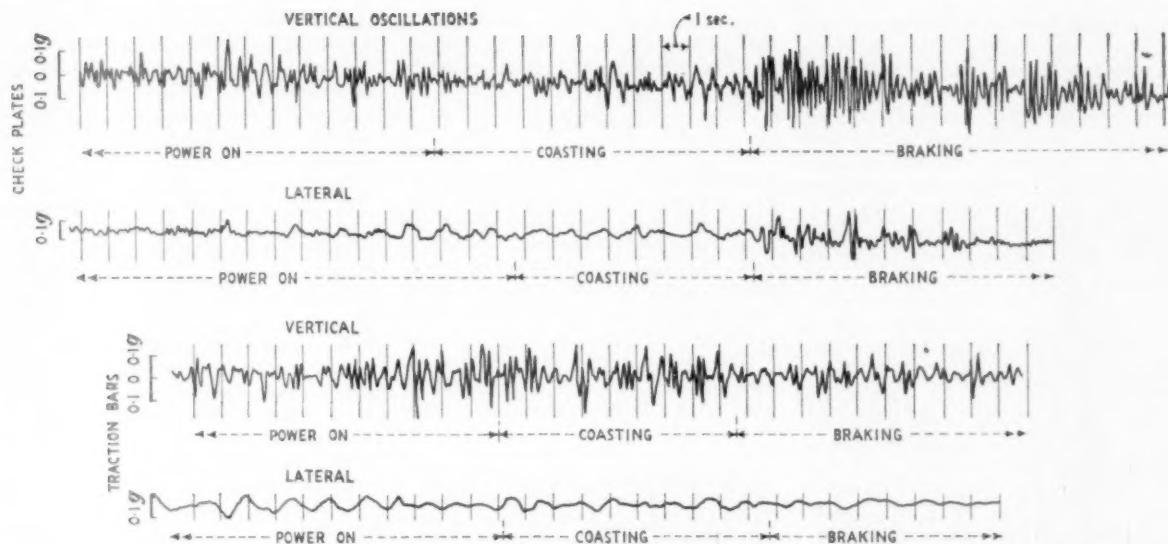


Fig. 4.—Use of bolster check-plates affects ride when starting and stopping. Use of suitably-designed and located traction bars ensures better riding

bolster to bogie frame. This is advisable because the height of the Y-axis about which the bogie is likely to pitch can be predicted fairly closely, but not exactly.

Brackets

With traction rods it will be advisable to provide brackets at bolster and bogie frame with holes (or a slot) at the nominal position as well as above and below it. Similar considerations apply to the fore-and-aft stiffness at the point of attachment. This can be altered by using rubber pads or bushes of different stiffness, or by altering the initial pressure on the pads. The advantages obtained by using traction bars are shown by the records (Fig. 1), obtained with the aid of accelerometers placed on the vehicle floor. The benefits ensured both vertically and laterally when accelerating and braking are obvious, but it should be mentioned that wrongly-positioned traction rods can cause rather unpleasant shuttle of the body (Fig. 2). A further point to be considered when deciding the position of traction rods is the influence this will have with individual axle-drives on the load transfer when starting.

5. The dampers. These can be required with primary and secondary suspensions and, with many designs, it will be prudent to make provision for fitting dampers in case of need. Dampers across axle-box springs might be called for to check excessive bogie bouncing and pitching but because of the sensitivity of normal commercial dampers to the strenuous conditions encountered here, they might be better fitted between bogie frame and vehicle body to deal with bogie pitching as well as with the body pitching and bouncing relative to the bogie frame. Alternatively, hydraulic dampers should be integral with positive axlebox guides.

6. The damper characteristics. It will be advisable to permit some latitude in dealing with the variations of broadly estimated "inbuilt" friction damping which is unavoidable, regardless of design. Dampers are now available to deal with vertical or lateral oscillations, the force-displacement velocity characteristics being readily adjustable over a wide range with the aid of an external knob provided to alter the valve setting (Fig. 5 of part II of this article).

Once the required damper characteristics are established, suitably-set standard-production dampers can be used throughout. Hydraulic dampers tend to transmit appreciable forces at high frequencies and as a result of sudden shocks likely to be encountered at high speeds. The forces transmitted under these circumstances can be reduced by the action of the mounting rubbers at points of attachment and further by the use of a suitable relaxation spring between damper and attachment (Fig. 3). The theory of the resultant vehicle relaxation system mainly originates from Professor H. C. A. Van Eldik Thieme and Mr. M. J. Moerkens.

Background of experience

The above approach is based on experience in the development of road and rail vehicles, power plants, and accessories. This should not be construed as an implicit acknowledgement of the victory of matter over mind, but as an effective approach to the development of an important vehicle component required to meet exacting demands in the face of very complex and varying conditions. Because of this, it will be desirable to permit ready changes of fundamental design parameters when considering the prototype development designs of bogies

incorporating novel features, or even conventional bogies destined for vehicles of a new type. Failure to do so can appreciably extend development time or be responsible for a possibly unjustified abandonment of an otherwise promising project.

Multiple-unit trains

The occasionally-encountered poor riding of multiple-unit trains diesel or electric, is sometimes excused by the fact that the driving power is distributed along the train. It is then stated that these trains cannot ride well because they are not pulled at the front and that the distributed sources of power conspire to generate forces conducive to poor riding. While it will be readily admitted that the heavy powered bogies with their heavier unsprung masses present a more difficult problem as far as good riding is concerned, it is erroneous to assume that multiple-unit trains are incapable of achieving good results.

The tractive resistance of modern bogie vehicles is about 11 and 22 lb. per ton at 70 and 100 m.p.h. respectively so that, for a six-car multiple-unit train, tractive resistance at 70 m.p.h., excluding frontal air resistance, will be about 2,500 lb.

It would be idle to pretend that this force applied at the end of the train will ensure good riding, while distributed at three power bogies, it will spell substantial deterioration. Quite apart from experience with long pushed electric- or diesel-powered trains on the continent, reflection regarding the initial buffer loads resulting from screw couplings or loads imposed by gangway faceplate springs should dispel notions relating to the riding of multiple unit-trains. Finally, tests carried out at speeds of up to 95

m.p.h. with locomotive-hauled multiple unit-trains have shown no significant difference as far as riding properties are concerned.

As indicated in Fig. 4, lateral ride index values with the power bogie leading were better than when locomotive-hauled, while better results were obtained when locomotive-hauled at the end of the train, although here the ride was better as a multiple unit vehicle at speeds over 80 m.p.h.

In the vertical plane, there was practically no difference. This is understandable, for the vehicle had bogies with traction bars between bogie and bolster, a factor eliminating the effect of tractive force on friction forces at the more frequently-used bolster checkplates. Better riding is not facilitated by the provision of only one motor bogie per vehicle or two motor bogies, one at each end of a four car unit. In the latter case, it might be more desirable, both technically and economically, to have one motor car, with all axles powered, and three trailers.

Distance between bogie centres

With carriages, the distance between bogie centres should be kept as great as possible to improve riding. With locomotives having much higher axle-loads, it is important to consider the design parameters also in terms of resultant flange forces.

Data published by French workers in this field suggest that, in the case of bogie locomotives with axle-loads of 18 to 22 tons, maximum flange force must not exceed 0.4 of axle-load. To keep down the flange forces arising from the wheels of the leading bogie, it was shown by Mauzin and Martin that the distance between bogie centres should not exceed half the length of the sinusoidal wavelength of the bogie motion.

As, for bogie locomotives, the latter generally varies between 55 and 82 ft., the distance between locomotive bogie centres preferably should not exceed about 30 ft. Reference to some 30 modern bogie locomotives shows that, in the case of Bo-Bo units, this dimension varies between 24 and 32 ft., with 25 to 27 ft. as the predominant values. The

effects of lateral track irregularities on the dynamic aspects of vehicle behaviour have been considered in some detail by Heumann.

Bogie weight

As the weight of vehicles should be generally kept down within limits set by overall economic considerations, bogie weight obviously must follow suit. The attack should be directed against unsprung as well as sprung components. With coaches, the former are mainly represented by the wheels, axles, axle-boxes, and part of the suspension weight.

Here, the adoption of smaller wheel diameters would appear to be eminently worth while. Thus, reducing the diameter from 3 ft. 6 ins. to 3 ft. would save some 500 to 600 lb. per wheel set, or about 1 ton per vehicle (see Fig. 5).

It might be argued that such a change could lead to unacceptably rapid wheel wear resulting from brake action, but attention is drawn to the fact that 3-ft. wheels are successfully used with British Railways railcars and that wheels of approximately the same diameter are widely used on the Continent with most coaches and railcars and at speeds of up to 100 m.p.h. As shown by Heumann and confirmed in service, tyre wear can be appreciably reduced when using positive means of axle guiding. The low unsprung mass also improves riding qualities by permitting a steadier body motion, particularly in the vertical plane. Elsewhere, considerations are given to the possibility of reducing wheel diameter to 2 ft. 6 in. and even to 2 ft., although here dissipation of brake heat is likely to

present real problems, particularly with axle-loads in excess of about 10 tons, bearing in mind that the heat dissipation effectiveness of a 2-ft. wheel is only about 60 per cent that of a 3-ft. wheel. Life of the roller bearings is a further consideration.

The weight of a number of representative modern coaches and railcar trailers are summarised below.

It will be noted that the weight claimed by the bogies is at its highest with vehicle 2, which incorporates a light-alloy body. This suggests that, particularly here, it will be desirable to keep down the bogie weight if full advantage is to be obtained from design possibilities. A better weight distribution has been achieved with vehicles 1 and 14 which also incorporate light-alloy bodies. The weight normally claimed by bogies of conventional coaches is in the order of 25 to 35 per cent of the total vehicle weight, and values of about 30 per cent should be arrived at with new designs. It also will be noted from the table that, expressed in terms of body weight, the amount claimed by bogies, with conventional designs, should not exceed about 45 per cent.

(To be continued)

J. W. ROBERTS AT PLASTICS EXHIBITION

At the International Plastics Exhibition at Olympia, June 21-July 1, J. W. Roberts Limited will exhibit Feroglas reinforced plastics and Ferobestos asbestos reinforced plastics. A colour film will also be shown featuring the production of Feroglas press mouldings.

No.	Total weight (tons)	Body (tons)	Bogie (tons)	Length over buffers ft. in.	Wheel dia. ft. in.	Bogies total weight (per cent)	Bogies body weight (per cent)
1	22.5	15.5	3.5	59 6	2 11 $\frac{1}{2}$	31.2	45.2
2	20.4	11.2	4.6	60 8	3 0	45	82
3	35.7	23.7	6.5	65 6	3 6	54.8	54
4	30	19.5	5.25	67 0	3 6	55	54
5	35	24.8	6.1	67 0	3 6	36.4	48.8
6	33	22.6	5.2	68 0	3 6	31.5	44
7	34.5	22.7	5.9	71 0	3 2 $\frac{1}{2}$	34.2	52
8	47	30.2	6.4	74 3	3 3 $\frac{1}{2}$	35.8	56.7
9	32.6	24.4	4.1	75 6	2 11 $\frac{1}{2}$	24.8	33.6
10	32.5	24.5	4	75 6	2 11 $\frac{1}{2}$	24.6	32.6
11	40.5	29.5	5.5	76 5	3 0 $\frac{1}{2}$	27.2	37.4
12	38.3	26.3	5	77 0	3 0 $\frac{1}{2}$	26.5	35.4
13	37	27	5	86 6	3 1 $\frac{1}{2}$	27	37
14	23.6	15.5	4.05	86 6	3 1 $\frac{1}{2}$	34.2	52.3
15	27.5	18.4	4.55	86 6	3 1 $\frac{1}{2}$	33	49.5



Fig. 5.—Traction rods or check-plates placed well above or below axis of bogie pitching can excite unpleasant body shuttle

PERSONAL

Overseas

MR. L. B. GEORGE, Chief of Rolling Stock & Motive Power, Canadian Pacific Railway, who, as recorded in our April 28 issue, is to retire, entered C.P.R. service as a shop messenger at Vancouver in 1910. He served overseas with the 72nd Battalion (Seaforth Highlanders) in the 1914-18 war, was wounded on the Somme, and worked in Woolwich Arsenal from 1917 until his repatriation to Canada in 1919 when he resumed his railway training as machinist apprentice at Vancouver. He served as Locomotive Foreman at Kamloops, Shop Foreman at Vancouver and Calgary, and Assistant Foreman, Motive Power, at Winnipeg, returning to Vancouver in 1936 as General Locomotive Foreman. He was Division Master Mechanic at Lethbridge when, during the 1939-45 war, he was given leave of absence to engage in special work for Canadian



Mr. L. B. George

Associated Aircraft Limited, and later to serve as Supervisor of Aircraft Production for the Department of Munitions & Supply. He returned to C.P.R. service in March, 1942, as Works Manager of the company's Weston Shops in Winnipeg, was promoted to Assistant Superintendent of Motive Power, Western Lines, in 1946. Mr. George went to Montreal as Assistant Chief of Motive Power for the system on January 1, 1948. He became Chief of Motive Power & Rolling Stock in 1957.

MR. W. D. DICKIE, Assistant Chief of Motive Power & Rolling Stock, Canadian Pacific Railway, who, as recorded in our April 28 issue, has been appointed Chief of Motive Power & Rolling Stock, was born and educated in Montreal, and joined the C.P.R. in 1915 as an apprentice at Glen Yard, Montreal. In 1918 he joined the First Tank Battalion for overseas service in the 1914-18

war, and in 1919 rejoined the railway as a machinist apprentice in Winnipeg. He was appointed Assistant Chief Draughtsman in 1933, and in 1934 Chief Draughtsman. In 1936 he became General Locomotive Foreman at Moose Jaw, and in 1937 Division Master Mechanic, Calgary. During the 1939-45 war Mr. Dickie was Supervisor of Machinery for the large munitions contracts undertaken by the Canadian Pacific Railways in its main shops throughout Canada. In 1945 he became General Supervisor of Machinery in the Motive Power Department at



Mr. W. D. Dickie

Montreal, and in 1948 was appointed Assistant Works Manager (Locomotive) at Angus Shops. His appointment as Works Manager came in 1951, and in 1957 he was appointed Assistant Chief of Motive Power & Rolling Stock.

British Transport Commission

MR. J. L. SIMPSON, Motive Power Officer, Line Traffic Manager's Office, Fenchurch Street, British Railways, Eastern Region, who, as recorded in our April 28 issue has been appointed Running & Maintenance Engineer, London, Tilbury & Southend Line, entered the service of the former Great Central Railway in July, 1920, at Annesley, and later received Premium Apprentice training at Gorton Locomotive Works. He was transferred to Ipswich in August, 1926, as Assistant Running Shed Foreman and, after filling similar positions at Leicester and Peterborough, was transferred to Bidston as Running Shed Foreman in January, 1928. He was appointed to similar positions at Lowestoft and Staveley in September, 1930, and December, 1932, respectively, and, in November, 1937, became Locomotive Depot Superintendent at Hornsey. Mr. Simpson remained at Hornsey until February, 1945,



Mr. J. L. Simpson

when he was appointed Assistant to District Locomotive Superintendent, Kings Cross, which position was re-designated Assistant District Motive Power Superintendent. Mr. Simpson became District Motive Power Superintendent, Southend District (Plaistow), in 1955, and Motive Power Officer, Line Traffic Manager's Office, Fenchurch Street, in 1956. During the war he was Company Commander with the rank of major in command of "E" Company, 33rd Middlesex Railway Battalion, Home Guard.

MR. T. M. HERBERT, Director of Research, British Railways Central Staff, British Transport Commission, retired on April 30.

MR. G. T. HARKER, Stationmaster, Hamerton, British Railways, North Eastern Region has been appointed Stationmaster, Marston Moor. Mr. Harker will also be responsible for Hammerton and Hessay.

MR. J. V. ELSON, Senior Assistant, Costings Division, and **MR. F. W. YOUNG**, Assistant (Works), British Transport Commission, have been appointed Assistant Works & Equipment Officers.

MR. C. B. M. PHILLIPS, Senior Executive Assistant to the Staff & Welfare Officer, London Transport Executive, has been appointed Assistant (Training & Education) Establishment & Staff Office, Liverpool Street, British Railways, Eastern Region.

MR. D. H. COOMBS, B.Sc.(ECON.), M.I.C.E., A.M.I.MECH.E., Assistant Engineer (Permanent Way), Chief Civil Engineer's Office, British Railways, Scottish Region, who, as recorded in our March 17 issue, has been appointed District Engineer, Glasgow North, joined the Metropolitan Railway, in 1924, as an engineering apprentice. He served with the



Mr. D. H. Coombs

London Passenger Transport Board and the London Transport Executive, becoming in 1951, Senior Executive Assistant. In 1955 he became Assistant Engineer (Permanent Way), Chief Civil Engineer's Office, Glasgow

MR. W. BROWNLEE, Assistant District Operating Superintendent, London (W), Euston, British Railways, London Midland Region, who, as recorded in our April 7 issue, has been appointed District Operating Superintendent, Liverpool Central, began his railway career with the former London Midland & Scottish Railway at Motherwell and became a Traffic Apprentice in 1947. After completing his training he was appointed Yardmaster, Shieldhall. He became first a Relief Stationmaster and then Staff Clerk before being transferred to London, in 1956, on freight development work. In 1957 he was appointed Assistant to the District Operating Superintendent, Crewe, and in 1957 Assistant District Operating Superintendent, Euston.



Mr. W. Brownlee

MR. H. EAGERS, District Engineer, Perth, British Railways, Scottish Region, who as recorded in our May 5 issue, has been appointed District Engineer, Doncaster, Eastern Region, was educated at King Edward School, Sheffield, and Jesus College, Oxford. He joined the London & North Eastern Railway at York in 1930, and, after holding positions in all sections of the Civil Engineer's Office, North Eastern Area, and District Offices, was appointed Assistant District Engineer, Darlington, in January, 1948, and District Engineer, Hull, in December, 1950. Mr. Eagers was appointed District Engineer, Perth, in 1953. During the 1939-45 war, Mr. Eagers saw service with the Transportation Branch, Royal Engineers, and spent four years in India, where he was latterly at General Headquarters engaged in the planning of railway developments for service requirements, with the rank of Lieutenant-Colonel.



Mr. H. Eagers

MR. H. GOWER, Head of Central Enquiry Bureau, Euston, British Railways, London Midland Region, has retired.

MR. L. S. WARRILLOW, Assistant (Staff) to the Motive Power Officer, Euston, British Railways, London Midland Region, has been appointed Personnel Assistant to the Line Traffic Manager, Crewe.

MR. I. W. STANDRING, Mechanical Engineer (Lifts & Escalators), London Transport Executive, has been appointed Contracts Officer, Works & Contracts Division, Acton. MR. E. P. LUMLEY, Assistant Mechanical Engineer (Works-Railways), has been appointed Mechanical Engineer (Lifts and Escalators).

Industrial

MR. W. E. PRIOR has been re-elected Chairman of the British Mechanical Rubber Manufacturer's Association for 1961-62.

MR. R. DINGWALL, Chief Engineer, and MR. W. V. GOLDING, Raw Materials & Transport Superintendent, Dorman Long (Steel) Limited, have been appointed Special

Directors of that company, and of the parent company, Dorman Long & Co. Ltd.

MR. I. ROTHERHAM is to be Chairman of the Council of the British Electrical & Allied Industries Association. The Vice-Chairman will be MR. S. E. GOODALL.

MR. M. ALONSO, Vice-President of Foreign Sales, Alco Products Incorporated, has been appointed President of Alco Products Export Co. Inc.

MR. D. N. CHAMBERLAIN, Vice-President Alco Products Export Co. Inc. has been elected Vice-President of International Operations, Alco Products Inc.

MR. G. E. MILLAR, Manager of Export Sales, Fairbanks Morse & Company, has been appointed General Manager of the company's International Division.

MR. C. D. B. WILLIAMS has relinquished his appointment as Technical Consultant & United Kingdom Agent for the Dutch and American Van der Horst companies.

MR. D. T. WONDERLY, Superintendent of Mining & Industrial Locomotive Manufacturing, General Electric Company of New York, has been appointed Manager of Locomotive Product Service.

The RT. HON. LORD CLITHEROE has been appointed a Vice-Chairman of Tube Investments Limited. SIR BEN LOCKSPEISER and SIR FRANCIS DE GUINGAND have resigned from the board. DR. J. M. KAY has been appointed Director of Research & Development from July 1.

Institute of Transport

MR. J. AMOS, Chairman, Scottish Omnibus Group has been elected President of the Institute of Transport for the year commencing October 1.

Transport Users' Consultative Committee

Under the provisions of Section 6 of the Transport Act, 1947, as amended by Section 29 of the Transport Act, 1953, the Minister of Transport has appointed PROFESSOR A. BEACHAM to be Chairman of the Transport Users' Consultative Committee for Wales and Monmouthshire until July 31, 1962, in place of the late MR. R. G. M. STREET.

Obituary

We regret to record the recent death of MR. E. MUGNIOT, General Manager of the Paris, Lyons & Mediterranean Railway from 1933 to 1938, when he retired on the formation of the French National Railways. He was born in 1882. He had an outstanding reputation in France for bringing forward young men, and three of his trainees MM. ARMAND, BOYAUX and DARGEOU became general managers of the S.N.C.F.

We regret to record the death, on March 17, at the age of 75, of MR. W. H. APTHORPE, Deputy Chairman and former Managing Director of the Cambridge Instrument Co. Ltd.

NEW EQUIPMENT and Processes

SITE SHOTBLASTING

A mobile shotblasting service is now operating throughout the United Kingdom, for which it is claimed that consistent standards of finish can be obtained on site which are fully equal to those carried out in a permanent shotblasting installation.

The equipment employed is transported to sites on two 7-ton trucks, each towing a 7-ton, four-wheel trailer. One trailer carries a Leyland/Brush 90 KVA diesel generating set to provide electrical power for the operation of driers, recovery plant and dust-suppression units, whilst the second transports a Consolidated Pneumatic type 600-RO-2 Rolls-Royce powered rotary "Power Vane" compressor which delivers 600 c.f.m. of compressed air at a working pressure of 105 lb. sq. in., for the operation of the Tilghman shotblasting equipment.

A considerably diverse range of contracts is undertaken with this equipment and, in particular, the solution of such problems as are involved in the selection of air driers to eliminate condensation forming when shotblasting the interior of tankers.

Particulars of this service may be obtained from R. J. Richardson & Sons, Limited, Commercial Street, Birmingham.

DIESEL DEODORANT

A new product has been introduced, the purpose of which is to (1) re-odorise diesel fuel in bulk, (2) improve the odour of diesel exhaust gases, (3) reduce, or eliminate, the lacrymal effects and nasal irritation which is prevalent with diesel exhaust.

Known as Redex/DD, this deodorant is based on Redex, to which has been added a deodorising compound. It is claimed that, in addition to fulfilling the functions mentioned above, the effect on a diesel engine is to keep the injectors, pistons and piston rings carbon free, which materially reduces heavy smoke emission other than from mechanical causes.

Full particulars are obtainable from Redex Limited, 365 Chiswick High Road, London, W.4.

ELECTRICAL IRON

"Super Permo" is a 99.7 per cent pure iron yielding high magnetic permeability with low remanence and coercive force properties, which are essential where high magnetic induction is required. It is also ideal for com-



ponents of communication systems where low remanence and coercive force ensure immediate response to minute current signals.

The material is available in the form of ingots, billets, and slabs. In the finished state it is supplied in sheets, strips, special sections, and castings.

Full information is available from Samuel Osborn & Co. Ltd., Clyde Steel Works, Sheffield.

WELDING RODS

The range of welding products supplied by the Suffolk Iron Foundry Limited has been increased by the introduction of two new welding rods. Silver solder No. 38 is a general purpose silver brazing alloy with a low melting point of 620-640 deg. Sifcut No. 40, which is included in the cast-iron and hard-surfacing alloys group, is a composite rod of tungsten carbide particles in a nickel Sifbronze matrix.

Further details of these and other welding products may be obtained from Suffolk Iron Foundry (1920) Limited, Sifbronze Works, Stowmarket, Suffolk.



ELECTRONIC WEIGHING

A new range of electronic-weighing equipment is being introduced into Great Britain by Rotax Limited, under a licence agreement with an American manufacturer of this type of equipment.

Weight indication can be given on a visual dial indicator, a full numerical digit indicator or digital display. Weight recording can be given using a pen recorder or made digitally, with print-out on a ticket or tape. Combinations of these can be supplied if required and equipment can also be provided to drive teletype and punch card accounting equipment.

Provision can be made to integrate the system into process control schemes. It is particularly adaptable for use in batch weighing, tank and hopper weighing, crane weighing and weighbridge systems.

For further information apply to Rotax Limited (Process Control Group), Chase Road, London, N.W.10.

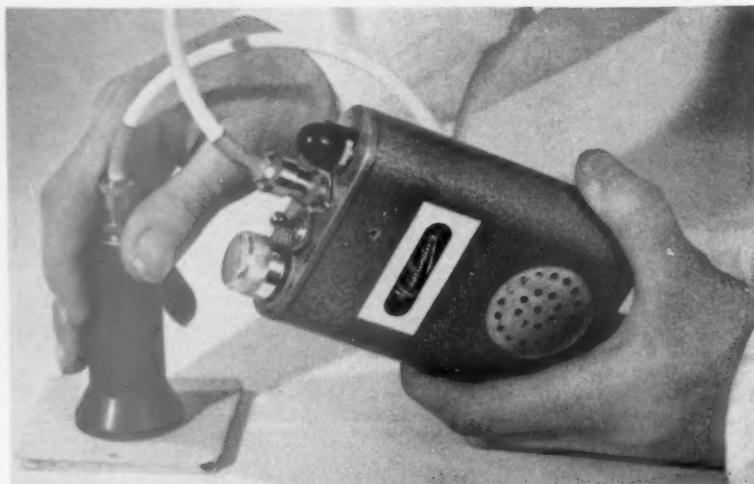
ADHESIVE

A new adhesive, Evo-Stik impact adhesive "633," consisting of a one-part rubber/resin formula, has been developed to provide a strong resilient bond when joining polyurethane or polyether foam to materials such as fabric, wood, and metal, without affecting the microcellular structure of the foam.

The adhesive, it is claimed, provides an efficient bond for microcellular foam to itself without causing any hardening effect at the joint. This property is useful to manufacturers using foam plastics as soft padding material.

It is water and oil-proof, and resistant to high temperatures.

Further details may be obtained from Evode Limited, 82 Victoria Street, London, S.W.1.



THICKNESS GAUGE

The "Audio" thickness gauge enables sprayed non-magnetic metal coatings on magnetic-base materials to be rapidly checked. Audible indication is given when the thickness and quality of the sprayed coating fall below a known standard.

For most commonly sprayed metals the instrument will cover the range of .002-.012 in. coating thickness.

The meter utilises the passage of eddy currents in the sprayed coatings, and is sensitive to changes in the resistance of the coating metal. The instrument must therefore be adjusted on a sprayed coating corresponding in composition to that which is to be measured.

Differences between one or more coats of paint, where the film thickness for each coat is of the order of .001 in. are reported to be readily detectable by this meter.

In some circumstances this instrument is applicable to metallic bases other than ferrous ones, but these are special cases calling for individual consideration.

Full particulars are obtainable from Metallisation Limited, Pear Tree Lane, Dudley, Worcs.

PIPES AND FITTINGS

Epoch pipe is manufactured from high-strength glass and acrylic fibre and thermosetting epoxide resin to give all-through corrosion resistance. In the manufacturing process, the resin impregnated glass-fibre rovings are wound on to preheated mandrels—a process which results in a mirror-smooth pipe bore.

The combined corrosion resistance and smooth bore prevent build-up of internal wall deposits and cut frictional losses—features which are reflected in maintained high rates of flow and low pumping and maintenance costs.

Epoch pipe and fittings are made in sizes from 4 in. to 15½ in. bore, and can

be used in temperatures up to 140 deg C. They are as strong as steel pressure-pipes, and are reported to be one-quarter the weight and 10 times more flexible, making them particularly suitable for laying over rough ground or in locations where soil subsidence might occur.

The Epoch pipe system comprises 20-ft. lengths of straight pipe and a standard range of bends and tees, although special bends and junctions can be supplied.

Full information is obtainable from Bristol Aeroplane Plastics Limited, Filton House, Bristol.

FLOOR CLEANING MACHINE

The Cimex Eagle Mark II floor-cleaning machine is designed for scrubbing and drying large floor areas in a single action. The machine, which can be handled by one operator, is electrically self-propelled and incorporates a three-brush, counter-rotating, scrubbing head to give a deep penetrating scrub.

Clean water is supplied from a fibre-glass tank mounted on the machine; the

used water and dirt are drawn up by a vacuum squeegee and deposited in a separate tank. Each of the two tanks has a capacity of 10 gal.

The brush unit, which is driven by a ½-h.p. motor, is constructed from high-tensile aluminium castings, in order to resist corrosion. The propulsion unit consists of a ½-h.p. motor with independent, differential belt-drive to half-shafts carrying 9-in. dia. main wheels. This motor also drives the suction unit. For safety reasons the switchbox is constructed in rigid P.V.C. The machine can be supplied for operation on various voltages over the range 110V. to 250V., a.c. or d.c.

It is claimed that the rapid sequence of scrubbing and drying, and the elimination of loose water, enable floor maintenance to be performed during normal working hours, and that one machine can replace four or five separate scrubbing and drying machines.

Further details may be obtained from Cimex Limited, 43-65, Cray Avenue, Orpington, Kent.

VENTILATORS

A range of ventilator units is now available, for ridge or roof-slope mounting, which, it is said, meets the demand for positive ventilation while retaining attractive lines to blend unobtrusively with architectural layout.

Construction is from galvanised sheet. No side drilling of structural roof members is required for fixing.

The totally-enclosed motors are mounted on rubber bushes to eliminate vibration. Bearings are of the oil-impregnated type.

Four basic sizes are available, with fan output capacities of from 1,900-9,100 cu. ft. min.

Additional information can be obtained from W. G. Cannon & Sons, Limited, 38a St. George's Drive, London, S.W.1.



Rolling-stock exhibition at Marylebone

Four steam engines and ten of the latest diesel, electric, and gas-turbine locomotives, some of them on public view for the first time, are included in a railway rolling stock exhibition which will be held at British Railways' Marylebone Parcels Depot on May 13 and 14. The exhibition has been arranged by the British Transport Commission as part of the Golden Jubilee celebrations of the Institution of Locomotive Engineers. Exhibits have been selected to cover the latest forms of railway motive power as well as examples of steam locomotive progress since the turn of the century, embracing the 50 years since the Institution's foundation in 1911.

On view for the first time will be the new 3,300 h.p. "Deltic" locomotive, the most powerful of its kind in the world; a 2,700 h.p. gas-turbine engine which will shortly begin trials in revenue-earning services on British Railways, and the latest 1,700 h.p. diesel-hydraulic locomotive with a transmission system incorporating an oil-operated torque converter, and gearbox. Steam engine development will be represented by four well-known locomotives: a Midland compound engine built in 1902; "Mallard," holder of the world's speed record for steam, built in 1938; "The Duke of Gloucester," the last of the big express passenger engines, built in 1954, and "Evening Star," completed in 1960, the last steam locomotive built for British Railways.

Other modern rolling stock on show includes one of the latest 3,200 h.p. 25kV a.c. electric locomotives, a 2,500 h.p. d.c. electric locomotive, and five main-line diesel locomotives ranging from 800 to 2,500 h.p. Two London Transport "silver" coaches will be on view, one from a Metropolitan "surface" train and the other from a Central line tube train. British Railways' vehicles include power cars from a diesel train for the Marylebone suburban service and from an a.c. electric train for the London, Tilbury & Southend Line now being electrified. Also on display will be two diesel training coaches; a dynamometer car used for testing locomotives; the latest second-class sleeping car, and a restaurant-buffet-kitchen car.

Four-character headcodes for British Railways

Four-character headcodes will be displayed and illuminated at night on the fronts of locomotives and trains of British Railways which will indicate the class of train, the area to which it is going, and the number of its "path" or timing in the railway's operational timetable. For example, the "Royal Scot" from London (Euston) to Glasgow will be identified as "1 S 57." The code provides a simpler and more effective means of identifying and reporting trains. In modern signalboxes it will be automatically displayed on the track diagram to identify trains as they progress from signal to signal. The existing method of placing oil or electric lamps in different positions on the front of trains will continue to be used with steam locomotives as illuminated indicators cannot easily be fitted to them.



British Railways electric locomotive displaying new four-character headcode

The four-character codes will be displayed on the fronts of trains in a single panel with four divisions or, where it is difficult to position a single panel, in two separate panels, each having two divisions. Reading from left to right the characters of the code are a number, followed by a letter, and two more numbers indicating respectively the class of train—express or stopping service, passenger or freight; its destination area or district; and the number of its timing in British Railways' domestic timetable. There will be some variations of the code for suburban services, where large numbers of trains run on set routes, and terminate at many different destinations in the same area. Any indicator space which is not used will display a dot.

Application to signalling

The most important function of the new system is in railway signalling. Modern power-operated signalboxes control much larger areas than the old manual type worked by levers, and signalmen in these new installations have many more trains to identify, to signal over routes in their area, and to describe when they pass them into the area controlled by the next signalbox. The latest signalbox control panels can display the train's four-character headcode in a series of apertures, either at each signal position on the track diagram itself, or on a separate panel. As the progress of the train is recorded by a series of miniature red lights on the track diagram, the illuminated train description also moves along in sequence from one display aperture to the next.

This system is already in use on the Manchester-Crewe electrification. The signalman at Manchester, London Road (the terminal), sets up the train's description by push-buttons (telephone-type dials are used in some installations), which then appears in the first aperture on the track diagram and moves along as the train progresses. When the train reaches a predetermined point the description is automatically passed forward by the apparatus from the London Road box and appears on the diagram at Wilmslow signalbox, the next one along the line. From Wilmslow it is automatically passed on to the next signalbox at Sandbach. In this way the signalman has a visual and a pro-

gressive indication which identifies each individual train. In very busy boxes several trains may have to be described in quick succession and these can be "stored" in sequence in the apparatus until the appropriate display aperture becomes vacant.

Reference to the introduction of this type of headcode in the Western Region was made in our issue of March 10.

Faster Scottish Region summer services

With the introduction of the summer timetable on June 12, the Scottish Region of British Railways is speeding up named trains and other services. Diesel replaces steam on all trains north of Inverness, with time-saving connections to and from London. The weekday "Caledonian" which leaves Glasgow at 8.30 a.m. will arrive at London Euston 10 minutes earlier. The "Caledonian" from Euston will leave at 3.55 p.m., 10 minutes later than last year, and arrive at Glasgow Central five minutes earlier. The "Royal Scot," leaving Glasgow Central at 10 a.m., will also arrive at Euston 10 minutes earlier, and its London equivalent will leave at 9.15 a.m.; 10 minutes later than last year, but will reach Glasgow five minutes earlier. On Saturdays, the "Royal Scot" will reach London 10 minutes earlier, and the Glasgow-bound train will cut 20 minutes off the journey from London. With diesel locomotives hauling the "Aberdonian" on the journey from Kings Cross to Edinburgh, the time of arrival at Dundee and Aberdeen has been cut by 43 minutes. The "Night Scotsman" from Waverley to Kings Cross, which carries Edinburgh-London and Fort William-London sleeping cars will leave at 11.5 p.m. instead of 10.50 p.m. Passenger trains between Aberdeen and Inverness will be diesel hauled, as will all trains north of Inverness. Details of these extra high-speed diesels between Aberdeen and Inverness and connecting branches, already announced, will be available in a separate supplement. An extra train will also run in each direction between Inverness and Wick, covering the journey in 4 hr. 20 min. Other accelerations in

these services between the two towns will give connections with north and south-bound trains. The steamer from Stranraer to Larne will leave Stranraer at 7 p.m., and a new day service from London to Northern Ireland will be given by the 9.15 a.m. Euston to Glasgow Central train, which will reach Carlisle at 2.28 p.m. The connection from Carlisle to Stranraer leaves at 3.1 p.m. This service will not operate on Saturdays. The 5.15 p.m. train from Buchanan Street will leave at 6 p.m. The journey will be speeded up by 20 minutes on weekdays and 12 minutes on Saturdays, from Glasgow and 49 minutes on weekdays, and 34 minutes on Saturdays from Princes Street, Edinburgh. The Sutton Coldfield-Stirling car sleeper service will run on three days each week. Accommodation for a limited number of cars will be provided to and from Inverness.

Parliamentary Notes

Trunk Pipelines Bill

The Trunk Pipelines Bill, a privately-promoted measure, was debated in the House of Commons on April 27. The result of the debate was that the Bill was withdrawn on an assurance by the Hon. Richard Wood, Minister of Power, that he would hold discussions with those interested to introduce legislation, possibly next session, which would provide a framework in which proposals could be dealt with in relation to existing transport services, in the interests of the national economy, and under a procedure that would ensure adequate Parliamentary control.

Power signalling installation at Coventry

A new power signalbox of the most modern type, which is under construction at Coventry, will replace five existing mechanical signalboxes, four of which will be recovered and one converted to a shunting frame. The new box will control an area extending to Canley Gates Halt in the Birmingham direction, Humber Road Junction on the Rugby line, and to Gibbet Hill and Coundon Road on the Leamington and Nuneaton lines. The work will be carried out in conjunction with reconstruction of the station platforms and buildings and the remodelling of the track layout which is progressing in stages.

Semaphore signals will be replaced by modern colour light signals of high beam intensity, and the points converted from mechanical to electro-pneumatic operation. The whole area will be track circuited, the new track circuits being of the d.c. single rail type incorporating protective devices at the feed and relay ends, in anticipation of the electrification of this section of line on completion of the new station.

The operating room of the new signalbox will house a regulator and station announcer, in addition to the signalman, so that each will have an uninterrupted view of the illuminated track diagram on which all train description, track circuit and signal, point, route set, and train ready indications will be displayed. This will be mounted vertically at a convenient height with a small desk in

front of it on which the track layout is drawn to a reduced scale with push-buttons spaced at intervals corresponding to the signal positions. Each route will be set up and signalled by the operation of two push-buttons, one at the entering and one at the leaving end of the section. For the individual operation of points in an emergency three position switches and associated indication lamps will be also mounted on the diagram.

The separate desk for the regulator will be provided with a double-sided keyboard on which the operating telephone circuits in the area will be concentrated, the rear key panel being accessible to the signalman. A keyboard on a second separate desk for the station announcer will give access to platform telephones and control of the station public address system. Telephones located at all running signals will be connected to a panel on the signalman's control desk. Telephone plug-points at all signal locations will enable the maintenance staff to communicate with the signalman.

Within the area controlled from Coventry new signalbox train code numbers will be displayed in rectangular screens on the track diagram near the signal the train is approaching. The code number will be automatically transferred from one signal position to the next on the diagram as the train proceeds and then on to the receiving instrument in the next box as the train passes out of the Coventry control area. By this means the signalman can be kept informed of the identity and position of every train in his control area.

The new signalbox structure will be completed next September and the new signalling is programmed to be brought into use in March, 1962. This scheme when completed will result in an all round improvement in the regulation of traffic and provide greater safety, flexibility and reliability particularly under adverse weather conditions.

The signalling and telecommunications work is being carried out to the requirements and under the overall supervision of Mr. E. G. Brentnall, Chief Signal & Telecommunications Engineer, London Midland Region, the Main Signalling Contractor being S. G. E. Signals Limited. The contractor for the new signalbox is W. H. Jones Limited of Coventry.

Staff & Labour Matters

Railwaymen's pay claims

All three of the railway trade unions have submitted claims for improved rates of pay to the British Transport Commission.

The N.U.R. claim was for a substantial increase for salaried and conciliation staff. The A.S.L.E. & F., which represents the footplate grades, sought a 10 per cent increase; the elimination of the classification of drivers, and an improvement in the fireman's relativity. The T.S.S.A. have asked for an increase for the salaried grades which will maintain and be in accordance with the principles established by the settlement arising from the report of the Railway Pay Committee of Inquiry.

The last pay increase for railwaymen took effect from January 4, 1960, and arose from the findings of the Guillebaud Committee which was charged with the task of comparing railway rates of pay with those opera-

tive in other nationalised industries, public services and appropriate private undertakings. The Guillebaud Committee's Report recommended, as a result of its investigations, general increases of 8 per cent for wages staff and 10 per cent for salaried grades. In addition, certain grades which were deemed to be "out of line" or "badly out of line" with the general run of railway wages were given additional increases of five and 10 per cent respectively. There was also a revision of the wages structure and the conciliation grades were brought within a range of 14 wage groups. Separate rates of pay were introduced for shunting driving as compared with train driving. The London allowance was doubled.

The claims for improved rates of pay followed the offer recently made by the Commission to reduce the standard working hours of railwaymen by two hours a week, and for working parties composed of railway and trade union representatives to examine the most efficient and economical method of implementation. This offer had been accepted by the N.U.R. and A.S.L.E. & F. in respect of the salaried and conciliation grades they represent, but the T.S.S.A. have pressed for a standard working week of 38 hours for all salaried grades and have asked for their claim to be referred to arbitration, which under the machinery of negotiation, means the claim being considered by the Railway Staff National Tribunal.

Institution of Railway Signal Engineers' summer convention

The 1961 summer convention of the Institution of Railway Signal Engineers will be held at Dijon and Paris, by courtesy of the Société Nationale des Chemins de Fer Français. Members and their ladies will leave London on May 24.

On May 25 members will travel by special railcar to visit the marshalling yard at Dijon-Perrigny, and to inspect the electronic C.T.C. signalling system at Mouchard. The three French signalling companies, Société T.R.T., Établissements Saxby, and Cie. des Signaux et Entreprises Electroniques, will entertain members to lunch at Arbois, where they will later inspect signalling installations. That day a coach tour of Dijon has been arranged for the ladies, who will also visit the vineyards of the Côte d'or.

On May 26 the whole party will travel from Dijon to Paris, arriving in time for lunch. Members have been invited by the S.N.C.F. to lunch in two parties, one at the Gare du Nord, the other at the Saint-Ouen Laboratory of S.N.C.F. After lunch members in the first party will inspect the signalling at the Gare du Nord, while members of the other party will visit the laboratory. The Westinghouse Brake & Signal Co. Ltd. has hired a motor launch on the Seine, and have invited members and their ladies to join them on board to see the illuminations.

On May 27 members will again be divided into two parties, that which visited the Gare du Nord the previous day will be conducted over the laboratory, while the other party will visit the Gare du Nord. For members who are interested, special arrangements have been made for a visit during the afternoon to Creil marshalling yard, where the latest R58 Saxby retarder can be seen. With the

exception of this visit, the afternoon will be free. In the evening an informal dinner has been arranged for the whole party. The whole of Sunday, May 28, has been left free. The return journey will be made on May 29.

U.I.C./F.I.A.V. Meeting

The annual meeting between the representatives of the International Federation of Travel Agencies (F.I.A.V.) and the U.I.C. was held at the headquarters of the latter organisation on April 27, 1961. The railway delegates included M. Desorgher, Chairman of the 3rd Committee of the U.I.C., Mr. Leach, International Traffic Officer, British Transport Commission and Chairman of the Passenger Traffic Committee, M. Poulet, Chief Passenger Traffic Officer, S.N.C.F., and M. Cousin, Chief Revenue Accountant, S.N.C.F.; F.I.A.V. was represented by M. de Wachter, Secretary-General, M. Brillant, Chairman of the Railway Committee, and M. Dumont.

This annual meeting between travel agencies and railway officials enables questions of interest to the two professions to be discussed and looked into and also provides the opportunity of improving existing friendly relationships.

CONTRACTS & TENDERS

An order of the approximate value of £5 million has been placed with the Clayton Equipment Co. Ltd., for 88 Type "1" diesel-electric locomotives. These locomotives will have a central cab, and will be provided with twin generating sets, one at each end. The locomotives will be able to operate on one or on both generating sets. Two Paxman engines, each of 450 h.p., will be fitted.

An order for traction equipment worth £1·76 million has been placed with the General Electric Co. Ltd., by the Clayton Equipment Co. Ltd., bringing the total value of traction business now in hand by G.E.C. to £6·5 million. The new order covers electrical equipment for 88 Type "1" diesel-electric locomotives for British Railways, and will comprise the main and auxiliary generators, blower and exhauster motors, traction motors and control equipment. Delivery of this equipment will begin in mid 1962.

The General Electric Company has received a \$2·6 million order from the National Railways of Colombia. The order is for 15 main-line diesel-electric locomotives. Six of the new locomotives are rated at 1,420 h.p., eight at 900 h.p., and one at 700 h.p. All are of the universal type and are suitable for passenger, freight, and switching service.

British Railways, North Eastern Region, has placed a contract with Westinghouse Brake & Signal Co. Ltd. for the provision and installation of colour-light signalling operated by Centralised Traffic Control between York and Beverley on the York-Hull line.

British Railways, London Midland Region, has placed the following contracts:

Norwest Construction Co. Ltd.: construction of freight concentration depot at Burnley Central Station, in connection with London Midland Region modernisation and electrification

Harbour & General Works Limited: platform surfacing at Burnley Station

Wilson Lovatt & Sons Ltd.: reconstruction of bridge No. 2 on the Trent Valley line for electrification headroom and widening, in connection with modernisation and electrification

William Latimer & Co. Ltd.: cleaning and painting at electric carriage shed and Chief Mechanical Engineer's workshops at Stonebridge Park

G. Percy Trentham Limited: reconstruction of Stafford Station, in connection with London Midland Region modernisation and electrification

Cellactite Co. Ltd.: renewal of roof coverings at District Engineer's Joiners' Shop, Liverpool Edge Hill.

BOARD OF TRADE

The Export Services Branch, Board of Trade, has received calls for tenders as follow:—

From India :

1. Doubling of track between Tiruvottiyur and Gummudipundi in North East line. Earthwork in formation from Ch. 0 to 24,400 ft. (Waltairend top point of Ennore.) Time for completion of work: five months
2. Doubling of track between Manubolu and Talamanchi in North East line. Proposed 23-70 ft. and 10-60 ft. span girder bridge for the second track over Pennar river at Mile 108/19 to 109/8 between Nellore and Padugupadu. Time for completion of work: 15 months.
3. Regrading and realignment of track between Hamsavaram and Tuni in Rajahmundry-Waltair section in North East line. Supply of 2 in. hard granite stone ballast between Mile 419½ and Mile 423½. Time for completion of work: six months
4. Doubling of track between Dwarapudi and Samalkot between Mile 371½ and 390½ in Rajahmundry-Waltair section in North East line. Supply of 2 in. size hard granite stone ballast for fast line and regrading the existing track. Time for completion of work: six months.

The issuing authority is the Engineer-in-Chief, Southern Railway, Egmore, Madras, 8, to whom bids should be sent. The tender No. is 17/CN/61. The closing date is May 22, 1961. The Board of Trade reference is ESB/14998/61. No further information is available at the Board of Trade.

15 groups of electrical signalling equipment including block instruments, cables, control desk, lever locks, circuit controllers, point machines relays, repeaters and indicators, route indicators, signals, cells and accumulators, and miscellaneous items.

The issuing authority is the Director, Railway Stores, Rail Bhavan, Raisina Road, New Delhi, to whom bids should be sent. The tender No. is SIG-2 of 1961. The closing date is according to groups: June 5, June 7, June 8, June 9, and June 12, 1961. The

Board of Trade reference is ESB/14167/61.

1 rotary, aircooled, railway vacuum exhauster, spares required for two years maintenance should also be supplied along with exhauster.

The issuing authority is the Director of Supplies & Disposals, 10 Mount Road, Madras, 2, to whom bids should be sent. The tender No. is MAD/E/7445-M. The closing date is June 2, 1961. The Board of Trade reference is ESB/15204/61.

From Pakistan :

1,000 inter vehicle coupler sockets and plugs, etc.

The issuing authority is the Pakistan Western Railway, Empress Road, Lahore, to which bids should be sent. The tender No. is S-1227/P2/6-60. The closing date is May 24, 1961. Local representation is considered desirable. The Board of Trade reference is ESB/14990/61.

8 centre wheels front truck bogie C.W.D. to drawing No. LW-1004 CME's drawing No. 3K-70 PRSS spec. No. M-2 for B-class steel

48 centre wheel tender for C.W.D. locomotive to drawing No. LW-1005.

The issuing authority is the Chief Controller of Stores, Pakistan Eastern Railway, Pahartali, Chittagong, to whom bids should be sent. The tender No. is P6/EA1/BC/24/60/ATW/ACST. The closing date is June 15, 1961. Local representation is considered desirable. The Board of Trade reference is ESB/14915/61.

From Sudan :

4 smithy hearths size 4 ft. x 4 ft. complete with electric motor driven fans. Electric motor shall be suitable for operation on 415 V. 3-phase 50 cycle and electrical equipment shall comply to S.G. Specification 541 revised

4 anvils of 250 lb. each.

The issuing authority is the Stores Department, Sudan Railways, Atbara, to which bids should be sent. The tender No. is 2374. The closing date is June 12, 1961. The Board of Trade reference is ESB/13957/61. No further information is available at the Board of Trade.

From the Philippines :

Design and construction of 200 all steel flat cars. The flat cars shall be of 40 tonnes capacity and shall be provided with stake pockets and stakes. General dimensions: track gauge 3 ft. 6 in., length over coupler pulling faces 37 ft. 3 in., length over end sills 34 ft. 8½ in., centre to centre of trucks 24 ft. 10 in., wheelbase, 6 ft. 3 in., width over side sills 7 ft. 2½ in., height, top of rail to top of floor 3 ft. 5½ in., height, top of rail to centre line of coupler 2 ft. 6 in.

The issuing authority is the General Manager, Manila Railroad Company, 943, Azcarraga, Manila, to whom bids should be sent. The tender No. is 10-61. The closing date is May 17, 1961. The Board of Trade reference is ESB/15264/61.

Further details relating to the above tenders together with photo-copies of tender documents, unless otherwise stated, can be obtained from the Branch (Lacon House, Theobald's Road, W.C.1).

NOTES AND NEWS

Alenco Limited expansion. Two Dutch companies, Ermelo Productie Maatschappij, N.V. and P. L. W. De Ridder & Company, N.V., have been acquired by Alenco Limited.

Change of address. Gabriel & Co. Ltd. has announced that, as from May 1, 1961, the address of its London office will be Buckingham House, 19-21, Palace Street, London, S.W.1. The telephone number remains unchanged.

1958 Census of Production. Part 63 of the Report on the Census of Production for 1958, Motor Vehicle Manufacturing, can be obtained from H.M. Stationery Office, price 3s., postage 2d. extra.

Brighton Station refreshment rooms. The refreshment rooms at Brighton Station have undergone extensive alteration as part of the British Transport Hotels & Catering Services modernisation programme. The premises will be re-opened to the public on May 18.

Desoutter factory in Sussex. Desoutter Bros. (Holdings) Ltd. has acquired a factory at Angmering in Sussex which was formerly occupied by Crawley Metal Productions Limited. A new wholly owned subsidiary (with a nominal capital of £250,000) will be formed to operate this acquisition as a separate unit of the Desoutter group.

Sulzer diesel output figures. Sulzer Bros. Ltd. diesel output figures for the total output of marine diesel engines, Winterthur and licensees' production for the year 1960 was 688,000 b.h.p., which accounts for 19 per

cent of the world production of 3,336,985 b.h.p. It is foreseen that these figures will rise by as much as 5 per cent during the current year.

Rain closes tube station. A sudden rain storm flooded the booking hall at Ruislip Manor Station on May 2. The station, which is on the Metropolitan and Piccadilly lines, was closed for 30 minutes.

London Transport push-chair service. To help passengers with children, particularly shoppers, arriving at Hemel Hempstead bus station, the London Transport Executive is providing experimentally a free "push-chair" service, which will start on Saturday, May 13.

Railwayman wins Road Safety Award. Mr. P. G. Cross, a signalman on the London Midland Region of British Railways, who lives at Millom in Cumberland, was awarded the National Trophy, presented by Shell Mex & B.P. Limited, for the greatest contribution to children's road safety during the past year. Mr. Cross has been responsible for training and examining nearly 600 child cyclists and also organises safety competitions for schools and youth organisations in his area.

Adex exhibition at Brighton. The photograph which appears below shows the Mayor and Mayoress of Brighton, Alderman and Mrs. A. J. M. Johnson, with Mr. G. Dodson-Wells, Chief Officer, British Transport Advertising, at the British Transport Advertising stand at the Adex exhibition, at Brighton recently. The theme of the display

was "the 4 Cs of British Transport Advertising"—colour, continuity, coverage, and economical cost.

London Transport summer timetables. The London Transport Executive summer timetables were brought into use in the central (red) bus area on May 10. Two routes have been amended to provide better facilities, one route has been curtailed because of poor traffic and the usual summer weekend improvements to routes serving beauty spots and other centres of attraction have been brought into effect.

Conference on use of capital. Sir Frank Lee, Joint Permanent Secretary to the Treasury, will open a one-day conference on profitable uses of capital which will be organised by the British Institute of Management in London on May 30. Papers will be given by Mr. F. C. de Paula; Mr. F. J. Young (Steel Co. of Wales Ltd.); Mr. A. T. Oram (British Oxygen Co. Ltd.), and Mr. J. E. Wall (Electric & Musical Industries Limited). Sir Joseph Latham (Associated Electrical Industries Limited) will take the chair.

Southern Region fire-fighting competition. The Southern Region of British Railways held the finals of its fire-fighting competition, on April 21, at the Surrey County Fire Brigade headquarters, Reigate. Twenty teams successful in the area contests competed. Challenge shields and cash awards were presented, by Mr. C. P. Hopkins, General Manager of the Southern Region of British Railways, to the winning teams and runners-up. The winners of each event will compete in the inter-regional finals on June 7.

More ferries to Skye. The Caledonian Steam Packet Co. Ltd. has announced that improvements to slipways at Kyleakin, on the Isle of Skye and Kyle of Lochalsh, have been completed by Inverness and Cromarty County Councils, resulting in two berths on either side. Four ferries will be operating at maximum on July 1, and 50 cars an hour each way will be conveyed. Two of the four ferries which will make the crossing, *Kyleakin* and *Lochalsh*, will each carry six cars, and the other two, *Portree* and *Broadford*, will each accommodate four cars.

Birmingham & Midland Motor Omnibus Co. Ltd. At the annual general meeting of the Birmingham & Midland Motor Omnibus Co. Ltd. on April 25 the Chairman, Mr. John Spencer Wills, said that the cost to the company of the wages settlement reached by the National Council for the Omnibus Industry was approximately £650,000 in a full year. A further wage claim had been submitted and referred to arbitration. Staff shortages were causing some concern. Satisfaction with the company's "Motorway" service on the M1 was expressed, and the indications were that the second year of operation would be even more favourable than the first. Mr. Wills also mentioned the recent Budget and said that once again the industry had not had any relief from the burden of fuel tax but he paid tribute to the Government for its surtax proposals. Mr. Wills drew attention to the cordial relationship the company enjoyed with the railways, neighbouring operators and local authorities.



The British Transport Advertising stand at the Adex exhibition at Brighton

Pollard poster campaign. Since April last year Pollard Bearings Limited has displayed posters at 59 stations in the principal towns and cities of Great Britain.

Cattle breeders' car-sleeper train. A special non-stop car-sleeper train left Norwich Thorpe Station, on the Eastern Region of British Railways, for Newcastle on May 9, carrying members of the Norfolk branch of the East Anglian British Friesian Breeders' Club. Space for up to 21 cars was provided, and three sleeping cars, and an open saloon, formed the remainder of the train.

Industrial Finishes Exhibition. The first International Industrial Finishes Exhibition & Convention was held from May 8 to 11, at Earls Court. The exhibition was opened by the Rt. Hon. the Viscount Davidson. Mr. A. A. B. Harvey, President of the Institute of Metal Finishing, also spoke at the opening ceremony. The convention run in conjunction with the exhibition was opened by Dr. J. E. Garside.

Eastern Region diesel and electric trains. Diesel and electric trains will account for 70 per cent of the total passenger train mileage in the Eastern Region of British Railways this summer. On the Great Eastern line the figure will be over 96 per cent. From May 20 additional trains will be provided at weekends to certain holiday resorts in East Anglia. Improvements will also be made to Great Northern main-line services between Kings Cross and Grimsby, and Kings Cross and Newcastle. The "Aberdonian" sleeping car train will be speeded up by 43 minutes.

Modernisation conference. Engineers and members of railway management from home and overseas attended the recent two-day railway modernisation conference at the Institution of Civil Engineers. The photograph below shows Mr. A. Porter, Technical Assistant to the Chief Electrical Engineer, British Transport Commission, discussing the railway electrical system with



One of the exhibits under discussion at the railway modernisation conference exhibition

Mr. P. Annavadhara of Thailand State Railways.

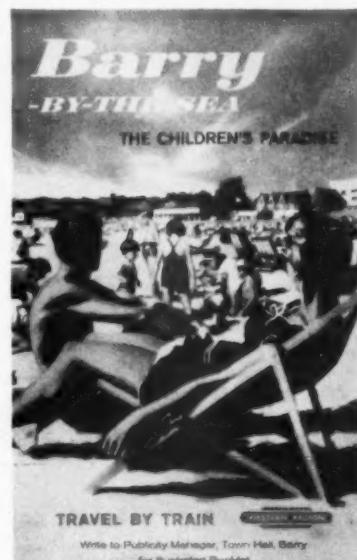
R.H.A. annual luncheon. Mr. Geoffrey Rootes, President of the Society of Motor Manufacturers & Traders, will be the principal guest at the annual luncheon of the Road Haulage Association to be held at Grosvenor House, Park Lane, London, W.1, on May 17. Mr. Rootes will propose the toast of the Association and the National Chairman, Mr. J. B. Mitchell, will reply. Mr. John Hay, M.P., Parliamentary Secretary Ministry of Transport will also attend, other guests include members of both Houses of Parliament.

Birmingham Railway Carriage & Wagon Co. Ltd. The Birmingham Railway Carriage & Wagon Co. Ltd. showed a loss on trading for the year ended December 31, 1960, of £304,638 compared with a profit of £113,431 for the previous year. An overall loss for the year, after charging depreciation and so forth, and crediting income-tax loss reliefs, etc., was £255,151, against a profit of £71,508. After payment of preference dividends, the debit balance on profit and loss account was £125,992 against a credit of £132,835. The loss incurred does not include any provision in respect of the cancellation of the London Transport Executive contract.

Electrical companies pool resources. The General Electric Co. Ltd. and Richardsons Westgarth and Co. Ltd. have announced that they have decided to pool their resources for the design, development, sales and manufacture of heavy electricity generating and industrial power plant. The manufacture of all plant covered (steam turbines, turbo-type alternators, blowers, compressors and exhausters) will be shared and initially based on current G.E.C. designs. Richardsons Westgarth will concentrate on the design of industrial power plant with the object of supplementing existing G.E.C. designs and widening the range of plant offered. R.W. will continue to be responsible for the sales

and manufacture of condensing and feed heating plant, rotary water strainers, evaporators, and shell boilers to its own design and land water-tube boilers to Foster Wheeler design as well as its wide range of marine engineering activities.

WESTERN REGION PUBLICITY



A new season's poster produced by the Public Relations & Publicity Department, British Railways, Western Region

City & Guilds of London Institute. The staff of the Institute will be absorbed with duties in connection with Commonwealth Technical Training Week from May 29-June 4 and have requested that correspondence and telephone calls which are not urgent be kept to a minimum. The office will be open and normal work in relation to 1961 examinations will continue but the telephone lines in particular will be in heavy use for C.T.T.W. purposes.

Sunday trains to the Yorkshire Dales. Through diesel train services from Sheffield (Midland) to Bolton Abbey will run each Sunday from May 14 to September 10 inclusive. Through trains will start from Sheffield (Midland) on Sundays at 10.5 a.m., and at 12.5 p.m., calling at Chapeltown (South), Elsecar & Hoyland, Wombwell (West), and Barnsley.

Locomotive Engineers' special train. A special train, chartered by the Institution of Locomotive Engineers, left Paddington Station on May 11 for Bath Spa, taking members on a visit to "Longleat," the home of the Marquess of Bath, as part of the Institution's 50th Anniversary Celebration. The train was made up of first-class coaches and a kitchen car, and had accommodation for 200 passengers. It was hauled by one of British Railways Western Region's latest diesel-hydraulic locomotives carrying a specially-designed headboard to mark the occasion of the Golden Jubilee.

Mechanical Handling Demonstration. Mechanical handling equipment for a wide range of loads and duties was shown last week at a press demonstration given by the Yale & Towne Manufacturing Company, Wednesfield. New models announced in the rider controlled fork-lift truck equipment were two diesel powered trucks of 3,000/4,000 lb. and 5,000/6,000 lb. capacity at 24 in. load centres. Production of these models, which are the first non-electric fork lift trucks to be produced by Yale in this country, will commence in June next. Having a travel speed of 8½ m.p.h. and a good ground clearance the diesel truck, fitted with a Perkins 60 b.h.p. engine, is specifically designed for yard use. In the earth moving equipment section a new model announced was the Trojan 204 tractor shovel. This is a two cu. yd. four-wheel-drive machine fitted with a Leyland 105 b.h.p. engine and Allison torquematic transmission. Sales of this machine will be handled by Jack Olding & Co. Ltd., Hatfield. In his address to press representatives Mr. J. O. Sewell, Managing Director, stated that overseas exports now absorb 40 per cent of the factory's production. Land had been acquired for further factory extensions but this expansion was at present held up owing to a district labour shortage.

Railway Stock Market

There has been some slowing down of activity in stock markets with buyers more selective, and a fair amount of profit-taking in industrial shares, but later, buyers again predominated. Financial results helped sentiment, though on the other hand, there have been many warnings from company chairmen about increased competition and rising costs. New issue activity is attracting increasing attention in markets; there are reports that many attractive offers will make their appearance in the next few weeks.

Among foreign rails, Costa Rica ordinary stock showed a fair number of dealings, and at 41½ compared with 40½ a week ago. Brazil Railway bonds were 4½ and Paraguay Central prior debentures 18. Salvador Railway consolidated stock marked 2, and Guayaquil & Quito assented bonds were 54½. International of Central America common shares came back from \$21½ to \$19, and the preferred stock from \$112 to \$110½.

Chilean Northern 5 per cent first debentures were 50. United of Havana consolidated stock has changed hands between 15s. and 17s., while the second income stock eased afresh from 6 to 5½; it is hoped at the meeting of holders of the consolidated stock on May 30 to make a statement on the question of a further distribution to stockholders, giving the result of the appeal against the Registrar's decision.

Antofagasta ordinary stock has come back from 16 to 15½, and the preference stock was 33, compared with 34½ a week ago. San Paulo Railway 3s. units have again changed hands around 1s. Mexican Central "A" bearer debentures lost a point at 58½.

Reflecting Wall Street, and helped by the Chairman's annual statement, Canadian Pacifics have rallied from \$43½ to \$46½, their best this year, while the 4 per cent preference stock firmed up from 60½ to 61½, though the debentures were fractionally

lower at 58½. White Pass shares eased to 59½.

Beyer Peacock 5s. shares were helped by the annual report, and at 8s. 3d. compared with 7s. 10½d. a week ago, but Charles Roberts 5s. shares eased from 8s. 6d. to 8s. 3d. There was a smart rally from 41s. 9d. to 43s. 9d. in Westinghouse Brake. G. D. Peters shares eased from 19s. 9d. to 18s. 9d.

There has been a fair amount of activity in Birmingham Wagon, awaiting the annual meeting for any further news of the position and outlook, and the shares at 32s. were within 6d. of the level a week ago. Wagon Repairs 5s. shares firmed up from 19s. 9d. to 20s., but Gloucester Wagon 10s. shares eased from 10s. 6d. to 10s. 3d. North British Loco. were 9s.

In electricals, A.E.I. receded afresh from 45s. a week ago to 42s. 9d., and English Electric from 36s. 3d. to 35s. 6d., but G.E.C. at 36s. 3d. showed a small gain compared with a week ago, and Crompton Parkinson 5s. shares at 13s. 7½d. have been well maintained. B.I.C.C. at 61s. 10½d. held the rise recorded a week ago, but elsewhere, Mather & Platt came back from 45s. to 43s. 6d. Tube Investments have been firm at 81s. 3d., British Oxygen 5s. shares were 36s. 3d., but reflecting the statements in the annual report on losses on nuclear contracts, Babcock & Wilcox moved down to 32s. 6d. xd. In other directions, Broom & Wade 5s. shares were 28s. 6d. Vickers have been well maintained at 36s. 6d., and in machine tools, Clarkson (Engineers) have risen further from 37s. 6d. to 39s. 6d., but Wolf Tools 5s. shares eased to 17s. 9d.

Pressed Steel 5s. shares, reflecting the labour troubles, dropped back further from 30s. to 28s. 4½d. Dowty Group 10s. shares were 39s. 6d. compared with 40s. a week ago, while Ransome & Marles 5s. shares reacted from 23s. a week ago to 19s. 6d. Pollard Bearing 4s. shares eased from 44s. to 43s. 6d.

Forthcoming Meetings

May 12 (Fri.). The Institution of Locomotive Engineers at Marylebone Goods Station. Exhibition of Locomotives and Rolling Stock. For the information of members only.

May 12 (Fri.). The Institution of Locomotive Engineers, at the Dorchester Hotel, Park Lane, London, W.1, at 7.15 p.m. Informal dinner. Admission by ticket only.

May 12-13 (Fri.-Sat.). The Institution of Electrical Engineers, Utilisation Group, Visit to Llandudno.

May 20 (Sat.). The Stephenson Locomotive Society, Dundee Centre, Angus Rail Tour.

May 25 (Thu.). The Institution of Electrical Engineers, Utilisation Section, at Savoy Place, London, W.C.2, at 5.30. Annual lecture on "Electric traction," Mr. J. A. Broughall.

May 26-28 (Fri.-Sun.). The Institute of Traffic Administration annual conference for 1961, at the Grand Hotel, Folkestone.

May 30 (Tue.). The Institution of Civil Engineers, at Great George Street, Westminster, S.W.1, at 5.30 p.m. The Unwin Memorial Lecture: "The work of the Institutions Research Committee," Professor J. F. Baker.

June 3-8 (Wed.-Mon.). The Permanent Way Institution, annual summer convention, at Newcastle-upon-Tyne.

June 5 (Mon.). The Historical Model Railway Society, London section, at Keen House, Calshot Street, London, N.1, at 7 p.m. "The Settle & Carlisle Line," Mr. N. Wilkinson.

June 15-24 (Thu.-Sat.). International Construction Equipment Exhibition, Crystal Palace, London.

OFFICIAL NOTICES

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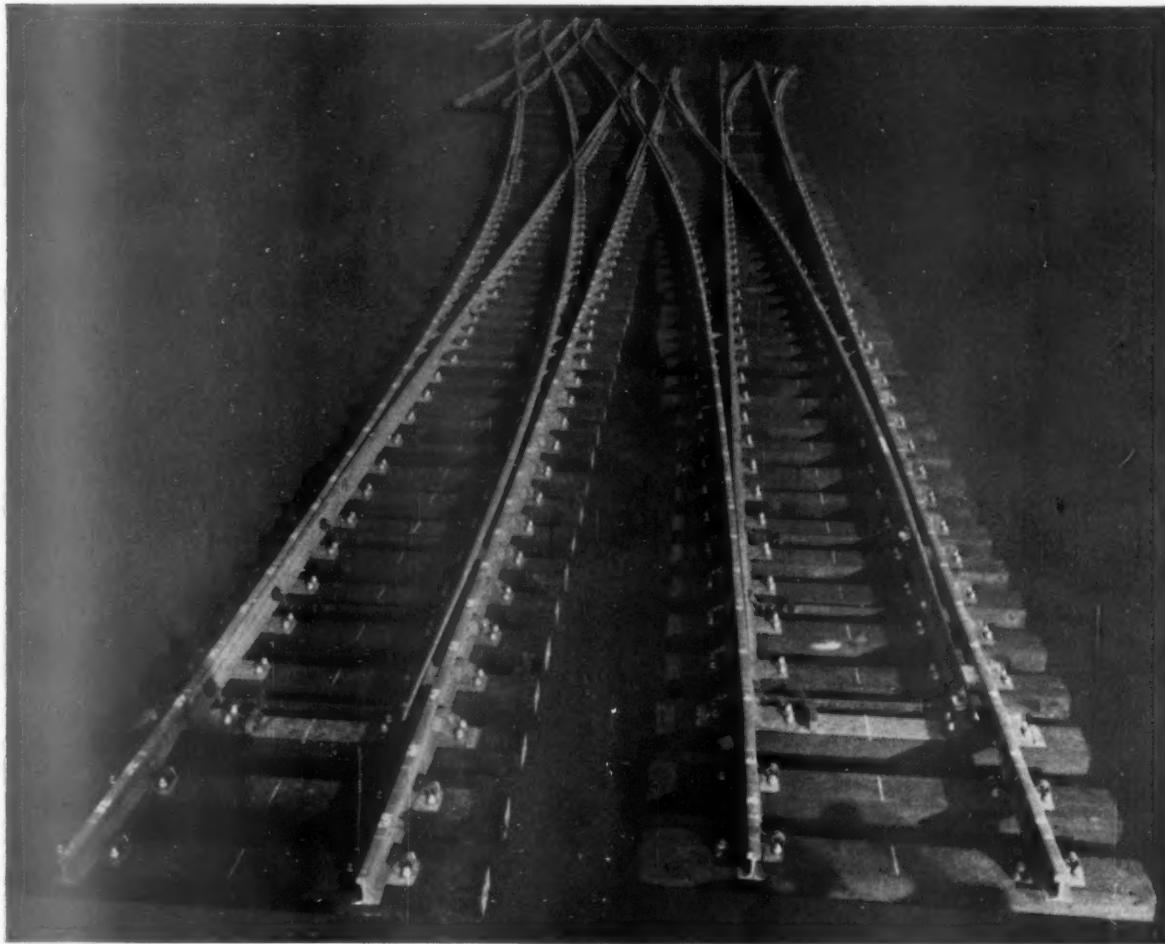
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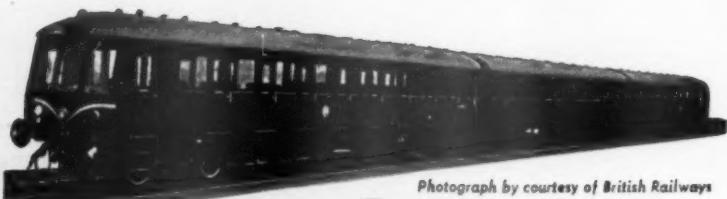


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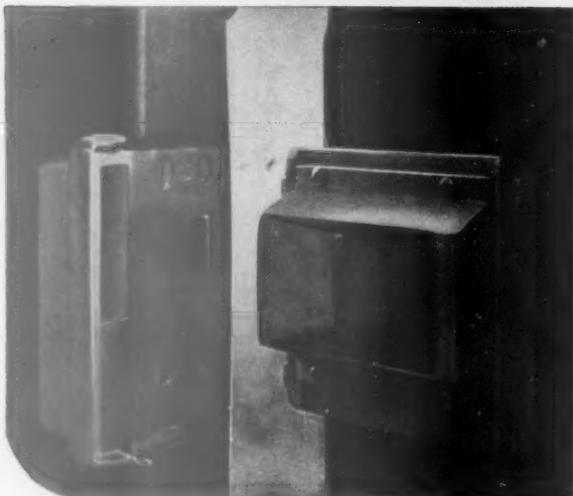
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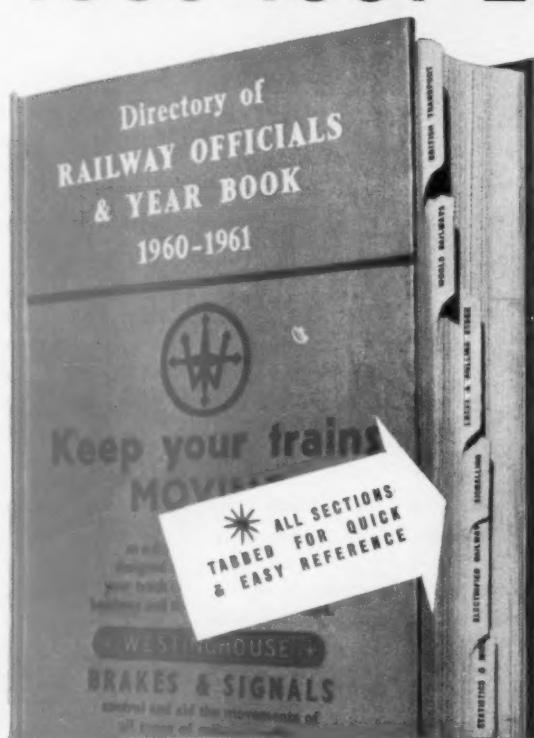


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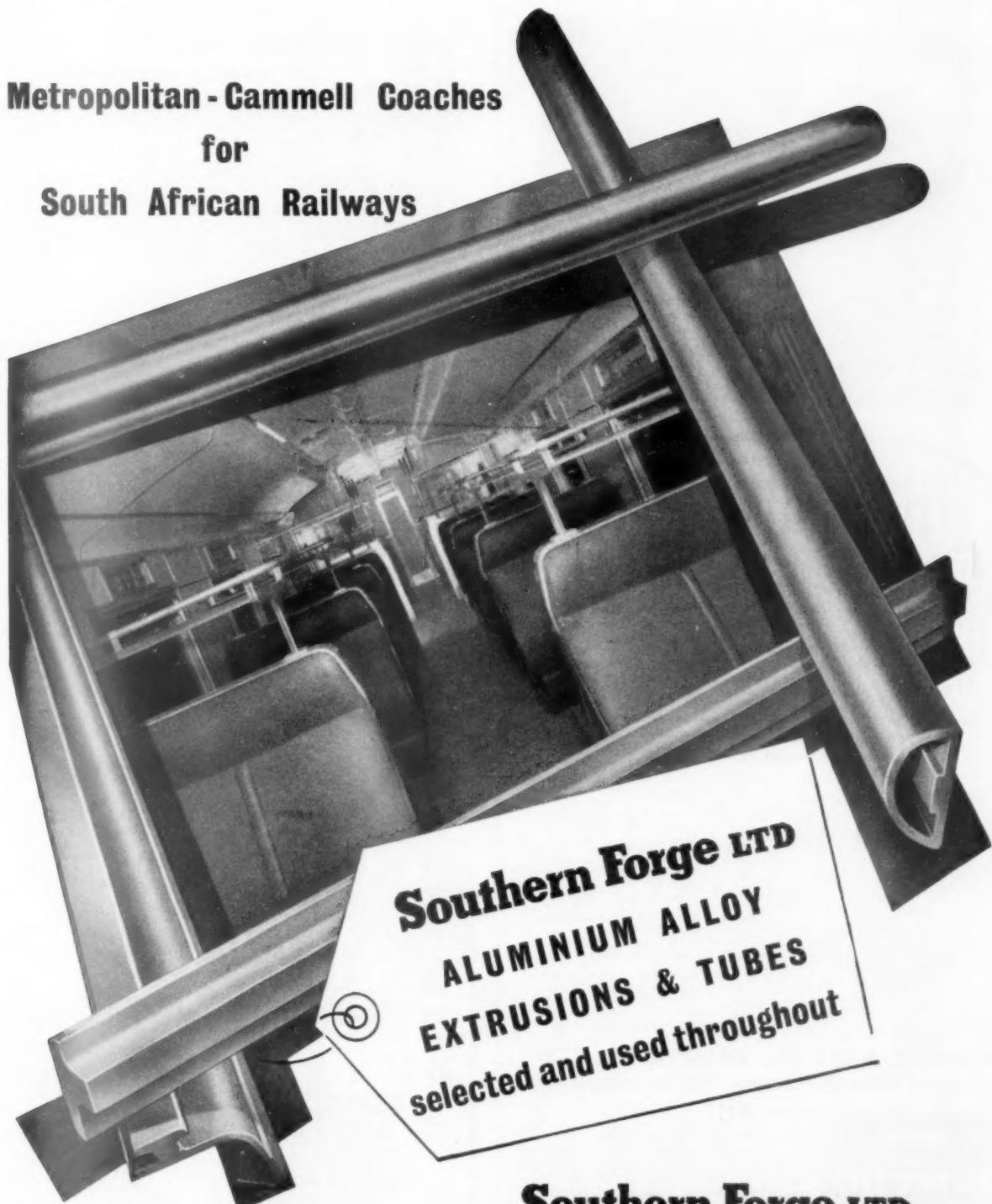
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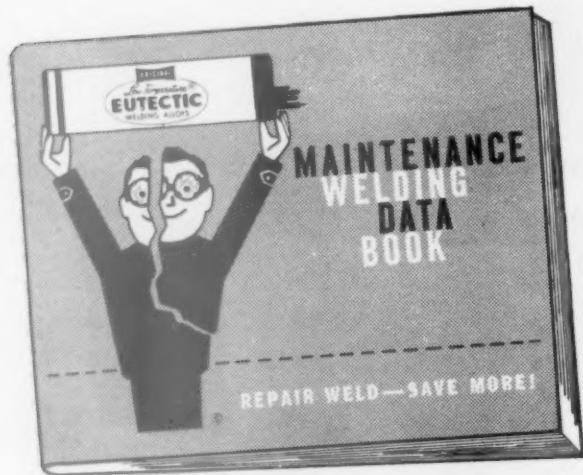


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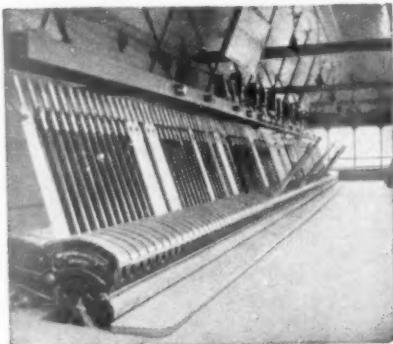
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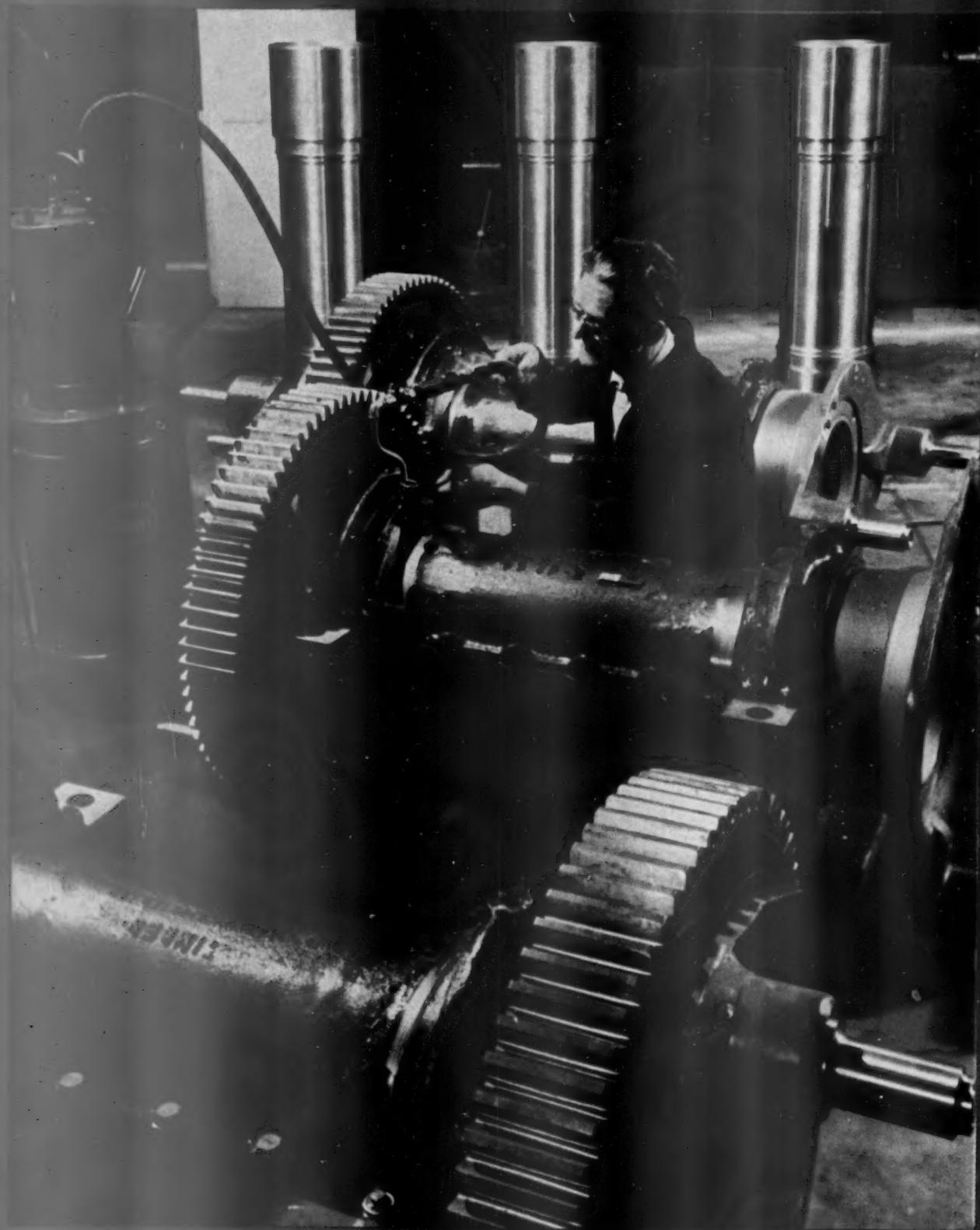
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